Indian Farming

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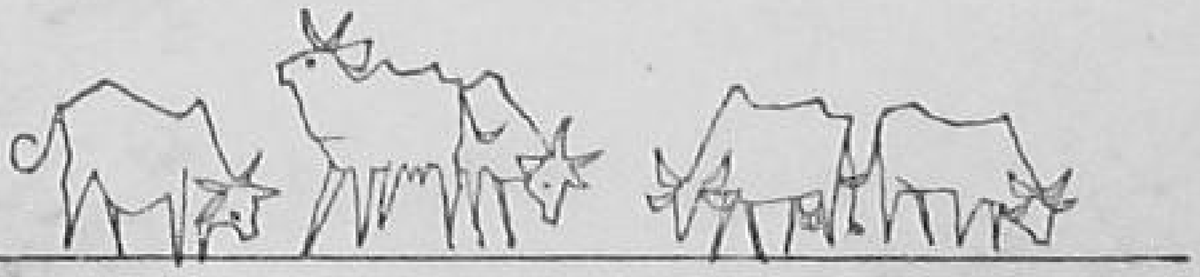

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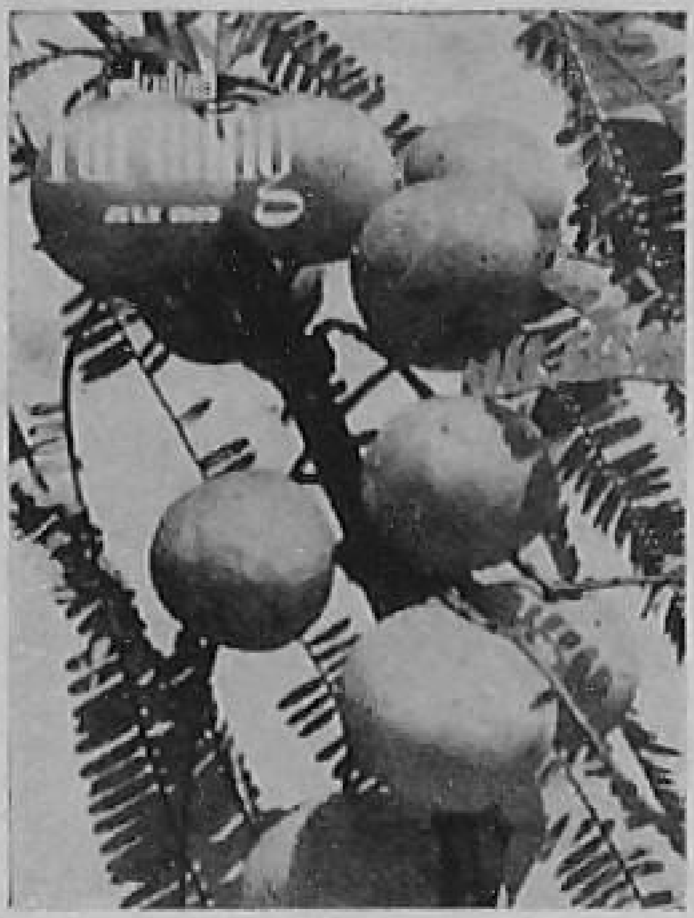

Of late, aonla or emblic has attracted a good deal of the scientific worker's attention for being the richest natural source of vitamin C. To many Indian medicines, however, it is an indispensable ingredient, and not only the fruits but seeds, leaves, bark and roots are also used. The tree is a prolific bearer, and so, quite profitable to grow.

Photo by H. K. Gorkha

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Indian Farming

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FERTILIZER TRIALS ON WHEAT

THE fertilizer trials conducted by the Union Ministry of Food and Agriculture under the Soil Fertility and Fertilizer Use Project, which was launched under an Indo-American Technical Agreement, have yielded highly useful information on the merits of different fertilizers for increasing wheat production. Two categories of experiments were planned under this scheme: complex factorial experiments and simple unreplicated trials. The former were conducted on 15-acre blocks at selected centres in seven states and the latter were carried out on cultivators' fields in eleven community project areas, the total number being 136 and 2,705, respectively. The report of the Standing Committee on Fertilizer Trials, which has just been released, makes a very interesting study and would serve as a corrective to loose thinking on the potentialities of different fertilizers for increasing yields.

In the simple trials, it was found that an application of 20 pounds nitrogen increased the yield of wheat by three maunds per acre when no other fertilizer was used. The response improved by 1.7 maunds when the level of nitrogen was increased from 20 to 40 pounds. The results from the complex experiments were more or less the same. In the case of phosphorus, the simple trials showed that an application of 20 pounds phosphorus per acre raised the yield by about 2.3 maunds per acre. The corresponding results from the complex experiments were somewhat poorer. The responses recorded from the application of potash were negligible. It was also found that the mean increase in wheat yield as a result of different combinations of nitrogen and phosphorus was generally equal to the responses obtained from the individual fertilizers when applied at the same levels. The results from the application of farmyard manure as a basal dressing were generally additive.

Urea and ammonium sulphate were compared at levels of 20 and 40 pounds nitrogen per acre in the simple experiments. The responses to both these fertilizers were nearly the same at the higher level, though at the lower level urea was found to give an additional response of 0.7 maund as compared to ammonium sulphate under irrigated conditions. Under unirrigated conditions, ammonium sulphate produced comparatively better results. In the complex experiments, ammonium sulphate and nitro-phosphate, as a source of phosphorus, proved to be of more or less equal value.

The results of a large number of trials conducted on cultivators' fields showed that a combination of about 40 pounds nitrogen and ten pounds phosphorus yielded the maximum net profit at the prevailing market rate of wheat and the cost of fertilizers. However, in view of the limited availability of nitrogenous fertilizers, a dose of 20 pounds nitrogen alone or in combination with ten pounds phosphorus can be recommended as sufficient in most wheat-growing areas.

Wheat is one of the most important food crops grown in India and its cultivation extends to over 29 million acres. It is, however, a pity that its average yield in the country, i.e., 648 pounds per acre, is the lowest as compared to the yields recorded in other advanced countries of the world. For instance, the average yield in the U.K. is 2,650 pounds per acre, in the U.S.A. it is 1,200 pounds and in Canada it comes to about 1,500 pounds.

One of the well-established methods of raising production is the use of fertilizers in optimum doses. It is, therefore, very important that close attention be given to educating the farmer in the technique of fertilizing his crop. The Report is no doubt a document of great significance, and should be read carefully by those who have to shoulder the responsibility of increasing food production in the country.

The Ace 'Pan'-grower of Vijayawada

by

S. L. Katyal

The vines trailed along *Sesbania* plants

WHEN I was recently on a visit to Vijayawada in Andhra Pradesh, I came into contact with a prosperous *pan* grower. He is Shri Kode Ramchandra Rao of Lobbipetta, about two miles from the City on the main road. Not that he has a big area under the crop ; only, he has learnt to utilize properly every inch of his small holding.

In fact, Rao does not possess any land of his own. He cultivates $4\frac{1}{2}$ acres which he has taken on lease. Of these, $1\frac{3}{4}$ acres are under betel-vine and the remaining under vegetables. Rao and his beautiful "*pan* grove" are both well known in Vijayawada.

SUITABLE CLIMATE

Explaining to me the reasons for his enviable success in betel-vine cultivation, to begin with Rao gave full credit to the suitability of the climate of Vijayawada. "Of course, that is not all. It also depends on how the other operations are conducted," he added.

He told me that the betel-vine grew best in a dry area where the soil always remained moist and there was enough humidity in and around the grove. The annual rainfall at Vijayawada is 25 to 30 inches, so the

climate is almost dry. To provide humidity in and around the grove, Rao grows *Erythrina indica.*

To prepare the land, Rao ploughs it five to six times before June-July. Weeds are completely removed. About 200 cartloads of well-rotted cow-dung manure per acre are thoroughly mixed with the soil. Then, 1½-foot wide furrows are made.

In the furrows, seeds of *Sesbania grandiflora* are first sown with a one-foot distance between them. The plants attain a height of five to six feet in two to three months, grow straight, and serve as ideal stakes for the vines. When I visited Rao's *pan* grove, he was planting 1½-foot long vine cuttings near the roots of *Sesbania* plants.

The leafless branches are bent down and buried in the soil near the trunks of Sesbania plants. When they sprout, they are again trailed up

Within three months of their planting, the vines grow five to six feet long. As they grow, they are trained along *Sesbania* plants by tying them with banana fibre. Earthing of vines is done from time to time, the leaves of *Sesbania* are pruned and used as fodder for cattle.

LABORIOUS, BUT INTERESTING

"No doubt the propagation and staking of betel-vines is laborious, but it's interesting," put in Rao.

Rao then went on to emphasize the importance of irrigation in betel-vine cultivation. He applies one irrigation every third day, except during the rainy season. This works out to about 80 irrigations a year.

Rao is not in favour of using artificial fertilizers for the crop, as he thinks they shorten the life of the vines and their yield is adversely affected.

"For good yields of betel leaf," said Rao, "use only cow-dung manure ; if sheep-dung is available, so much the better."

Every year during October, Rao weeds and hoes his grove and then manures it at 200 cartloads of well-rotted cow-dung manure per acre. He also makes use of a small dose of fertilizer such as ammonium sulphate—112 pounds per acre, or groundnut cake—five bags, "to keep the leaves green."

NEW DEVICE

Rao is of the opinion that the vines should not be allowed to grow beyond ten to 12 feet high, and only those leaves which are on the sub-branches and fully developed should be picked. He generally hand-picks his leaves, pinching them off the vines with the thumb.

On my interjecting that this was bound to be a painful operation if one had to work long hours, Rao showed me a device that he has evolved to solve this difficulty. It is an iron thumb-cover which he puts on his right thumb and cuts the leaves with. "With this I can continue picking leaves as long as I wish, without injuring my thumb," said Rao smilingly.

After every five years, Rao shifts the cultivation of the betel-vine on to his other plot.

Rao exports his betel leaves to places like Nagpur, Wardha, Delhi, Calcutta and a number of cities in Uttar Pradesh where there is a great demand for them.

Perhaps sensing that my next question would be about how much he made in this betel-vine business, Rao forestalled me by saying, "How much do you think I would be earning ?"

I replied, "No less than Rs. 2,000 to 3,000 per acre, I should say."

Rao was amused. "My average income is about Rs. 10,000 a year from this betel-vine grove alone," he said. He then explained that he got about 15,000 bundles of betel leaves, each bundle containing about 100 leaves and fetching him one anna to eight annas, depending upon the leaf quality.

NEW BOOKS RECEIVED

Scientific Principles of Feeding Farm Livestock

Published by Farmer and Stock-breeder Publications Ltd.; pp. 259; price 50 sh.; postage 1sh. 6d.

The principles of feeding farm livestock have lately been under review and newer ideas have been put forward by research workers in different countries. "Farmer and Stock-breeder" recently got the advisers, national and commercial, to talk over these matters with research workers. The considerable amount of constructive discussion and suggestions recorded have been brought together.

Silage and Haymaking

by Ian Moore

Published by Farmer and Stock-breeder Publications Ltd., pp. 109 plus 16 plates; price 9 sh. 6d.

This is a practical guide, giving the farmer precise advice on the smallest details of silage-making techniques. Sound theory is explained and translated into terms of farm practice in a simple way.

Forms of Rural Co-operation in the U.S.S.R.

by Y. Borisov

Published by the Information Department of the U.S.S.R. Embassy in India, 25, Barakhamba Road, New Delhi; price 20 nP

This brochure traces the history of co-operation in Russia. Topics like agricultural co-operatives, credit co-operatives, collective farms and consumers' co-operatives are dealt with.

Target Figures for the Economic Development of the U.S.S.R. from 1959 to 1965 (Abridged)

Published by the Information Department of the U.S.S.R. Embassy in India, 25, Barakhamba Road, New Delhi

UNESCO's Programme for Arid Lands

Published by the Department of Mass Communication, UNESCO, 19, avenue Kieber, Paris 16e, France

These informal notes are meant for the assistance of lecturers, organizers of study circles and discussion groups. The work done under UNESCO's arid zone research programme is described and a blueprint for future research presented.

Co-operative Studies, July, 1959

Published half-yearly by the Co-operative Training College, Poona; annual subscription, Rs. 2

Employer-employee relationship in co-operatives, finance for weavers' co-operatives, co-operation and students' organizations—are among the subjects discussed.

Proceedings of the Eleventh Meeting of the Standing Advisory Committee on Agricultural Credit

Published by the Agricultural Credit Department, Reserve Bank of India, Bombay

Proceedings of the Tenth Meeting of the Standing Advisory Committee on Agricultural Credit

Published by the Agricultural Credit Department, Reserve Bank of India, Bombay

Our Food

by M. Swaminathan and R. K. Raghavan

Published by Ganesh and Co. (Madras) Private Ltd., Madras-17; pp. 88 plus viii; price Rs. 1.50

The authors have presented in simple language the recent advances in the field of food and nutrition and some of their practical applications. This is intended to serve not only as a manual of reference but also as a general guide for application. Special emphasis has been placed on the use of milk substitutes of vegetable origin and other types of low cost, protein-rich foods and on subsidiary foods like roots and tubers as substitutes for cereals.

A New Wheat Finds A Home In Kangra Hills

by
Gurcharan Singh
Economic Botanist, Cereals and Pulses, Punjab
Jullundur
and
Sohan Singh Saini
Assistant Economic Botanist, Rice
Gurdaspur

A NEW wheat has been recently gaining rapid popularity with farmers in the Kangra hills of the Punjab. It is *C. 253*, a beardless type with a better yield. Moreover, it is totally resistant to yellow rust, moderately resistant to black and brown rusts and fairly resistant to smuts and bunts.

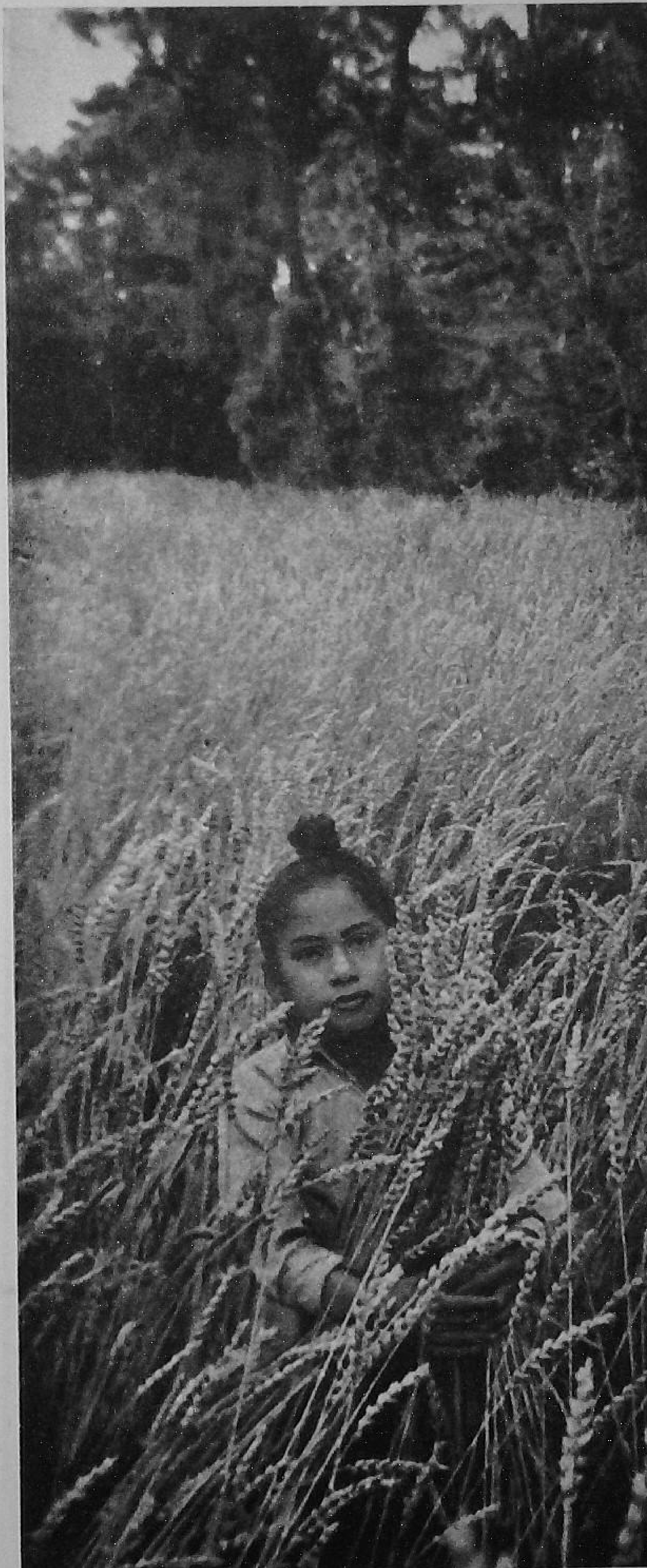
Wheat is an important crop of the Kangra hills. It is grown over about three lakh acres and follows the *kharif* crops of rice, maize and pulses. It can grow up to an altitude of 4,000 feet in the lower hills during winter and above 10,000 feet or so during summer, as in the Lahaul and Spiti Valleys.

In the lower hills, however, it is extremely cold and humid during the growth period of the crop. This encourages fungal diseases such as rusts, smuts and bunts. Again, at harvest, i.e., in May or June, the weather is uncertain and showers are received often. Hence, only beardless wheats which are early-ripening and easy and quick to thresh, suit the area. An extra advantage with them is that their *bhusa* is free from awns and is preferred by cattle to *bhusa* obtained from bearded wheats which cannot be threshed properly in the hills due to excessive humidity and stiffness of their straw.

C. 253 fulfils all these conditions.

C. 253 is a cross of *25 C* and *IP. 165*. It replaces *IP 80-5*, the erstwhile wheat of the tract. Though high-yielding, *IP 80-5* has long been out of the field

A good crop of *C. 253*



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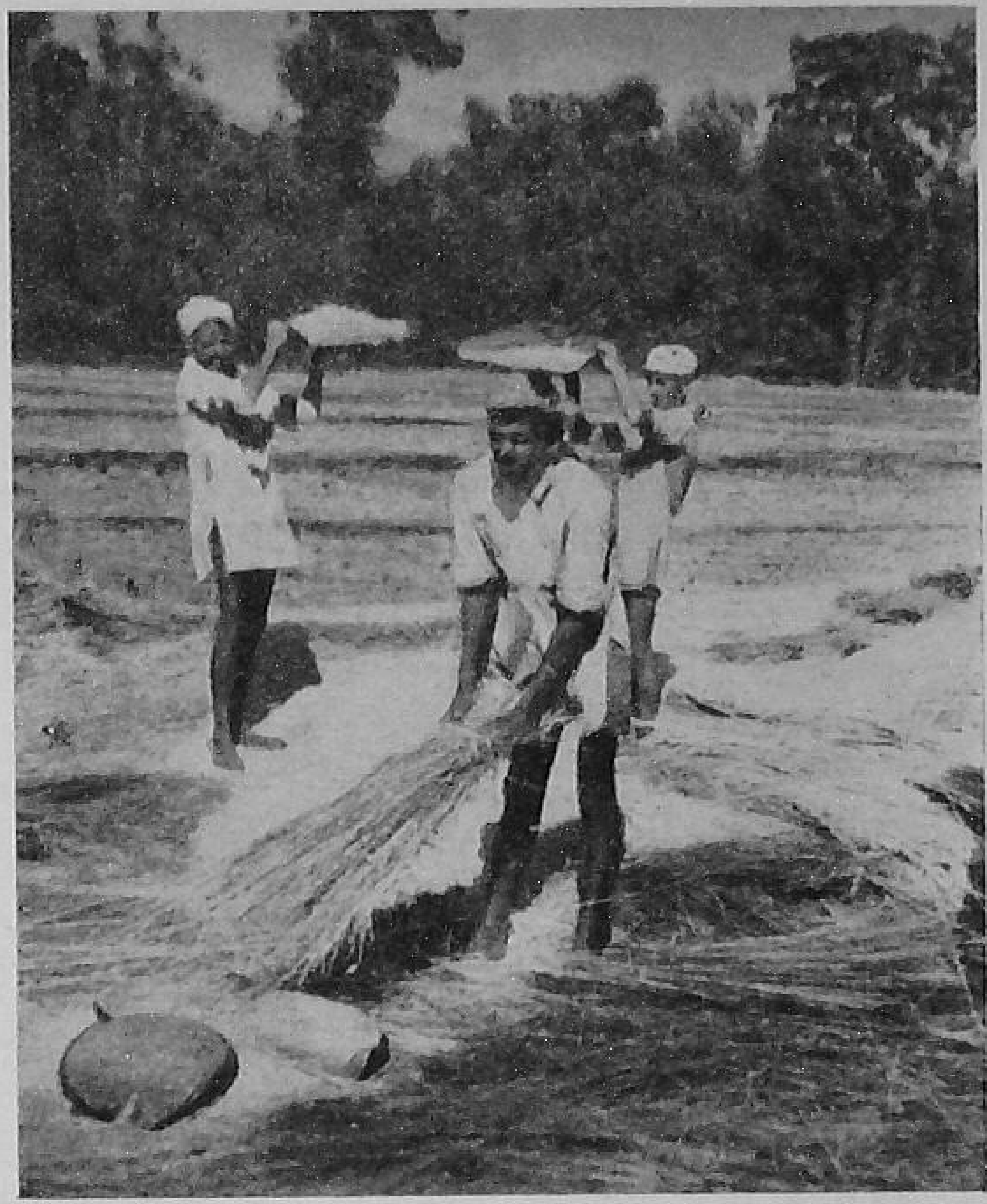


C. 253 **is easy to thresh—simply by beating the earheads on stone**

because of its high susceptibility to fungal diseases, particularly bunts ; its grain quality also is poor.

The grain of *C. 253* is bold and amber-coloured, and does not mottle. The earhead is long and lax, and contains 40 to 55 grains. The stem is fairly strong and resists lodging.

C. 253 takes 85 to 90 days to come into ear, and ripens much ahead of the local, bearded varieties. It thus vacates the land for the summer crops well in time.

C. 253 has been tried for a number of years under varied conditions in the district. Its yield performance has been very satisfactory. On an average, it has yielded over four maunds more per acre than the local beardless types at the Rice Breeding Substation, Nagrota. In fact, it had established its superiority over *IP 80-5* as far back as 1948 when the two wheats were compared in 20 trials. On farmers' fields too, it gave very encouraging results.

There is no doubt that *C. 253* has taken the wheat production in the area up to a fair degree.

The Cow-dung Gas Plant Is In The News Again

by
M.A. Idnani
and
O.P. Chowla
**Indian Agricultural Research Institute
New Delhi**

SINCE it was first introduced, the cow-dung gas plant has undergone a notable change—it now accepts farm wastes such as leaves and straw also, besides cow-dung. Accordingly, a number of other useful modifications in its design have been carried out. In fact, it now not only works much better, but also costs less to instal.

Enabling the plant to take leaves and straw without any reduction in its working efficiency, however, posed three problems: how to ensure their easy flow through the feeding pipe, how to prevent them from floating up and blocking the free passage of the gas into the holder, and how to clear the spent leaves from the fermentation tank. These have been solved in the following way.

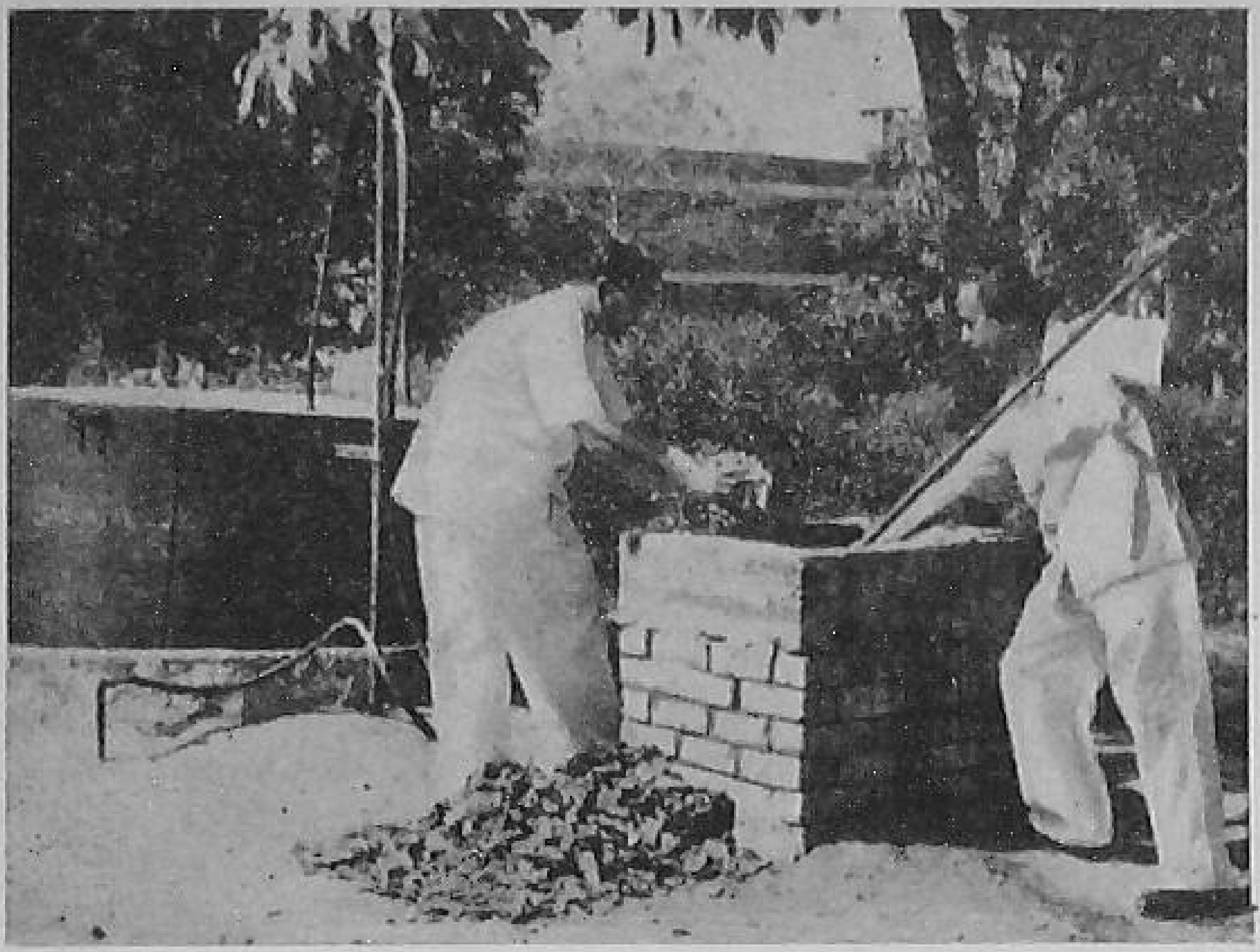
The feeding pipe is now a straight G.I. sheet or cement pipe of five inches diameter or square, instead of the original 2½ inches; its length also has been reduced to ten feet.

Again, the feeding pipe is now fitted in such a way that it emerges six inches inside the well, about three feet below the ledge. This makes the flow of dung or addition of leaves into the fermentation tank easy, and there is no danger of the pipe getting choked up.

To clear the thick floating bed of spent leaves in the fermentation well, a very simple gadget has been fabricated. It is a five-foot bamboo pole at one end of which a piece of wood about two feet long and 2½ inches wide is nailed at right angles to give it an "L" shape. This appliance is introduced into the space between the drum and the well, pushed down below the depth of the drum, and revolved to break the bed of leaves. Spent leaves are also periodically cleared from the bottom of the drum in this way; they float up to the surface and are then removed with the hands or with the ordinary kitchen tongs. The leaves thus collected are added to the compost pit.

The leaves or chopped straw or such other materials are put into the pipe about two handfuls at a time, and pushed into the fermentation well with a piston made of a 12-foot long bamboo pole, at one end of which a gunny piece or other cloth has been tied. To reduce

The tin burner that is simple, cheap and easy to make



Pushing leaves into the feeding pipe of the gas plant

the resistance in pushing the piston, a bucket of water is first poured into the feeding pipe. The operation is repeated till about five seers of leaves have been fed to the plant daily, in addition to dung. It is necessary that the dung slurry added daily is thin and is maintained thin in the fermentation well by adding sufficient water.

ENRICHING THE GAS

Gas production from leaves and straw has been found to be seven cubic feet per pound as compared to one cubic foot from a pound of fresh dung. But the illuminating fraction of this gas, methane, is only about 60 per cent. Tests with a gas lamp obtained from a Calcutta firm showed that with the composition and low pressure of about two inches water column, at which the gas was delivered from the plant, the intensity of the light obtained is rather low. After several trials, it was found that by enriching the gas by passing it through a simple trap containing a little petrol or a solvent oil, a significant improvement in the light could be made. A gallon of the enricher gives about 1,500 lighting hours per gallon; with about four lighting hours per day, this would last more than a year.

THE TIN BURNER

Conventional gas burners available in the market cost from eight to 12 rupees. Since methane does not require an admixture of air to yield a non-luminous flame, a simple and cheap burner from an empty cigarette tin has been devised. A hole half a centimetre in diameter is bored in the cylindrical side of the tin about half an inch above the base. A three-inch copper tube of the same size is then inserted into it and soldered. This serves to lead the gas into the tin. The lid of the tin is perforated with 1/8 inch holes all round at distances of about one inch. The tin is then filled up with stone, coal or brick pieces about 1½ inch in size and the perforated lid put on. The gas passing through the tin gets evenly distributed inside because of the pebbles, etc., and burns with a blue flame at the perforations. The burner costs only 50 nP to fabricate.

IMPROVEMENTS IN DESIGN

The following are the other improvements made in the design of the plant.

The 12-foot long angle-irons, bent at right angles and fixed from the ledge to support the gas holder, have been replaced with three eight-foot long, 1½-inch diameter G.I. pipes pushed two feet into the ground just outside the well. The pulleys on the top are between two shafts welded to the pipe. The pipe end that is buried has a six-inch square metal base welded to make the fixture firm. This has reduced the installation cost by about Rs. 30.

A wheel-cock is now screwed up directly to the nipple on the top of the drum, and a second nipple or a

The appliance used to clear spent leaves from under the gas drum

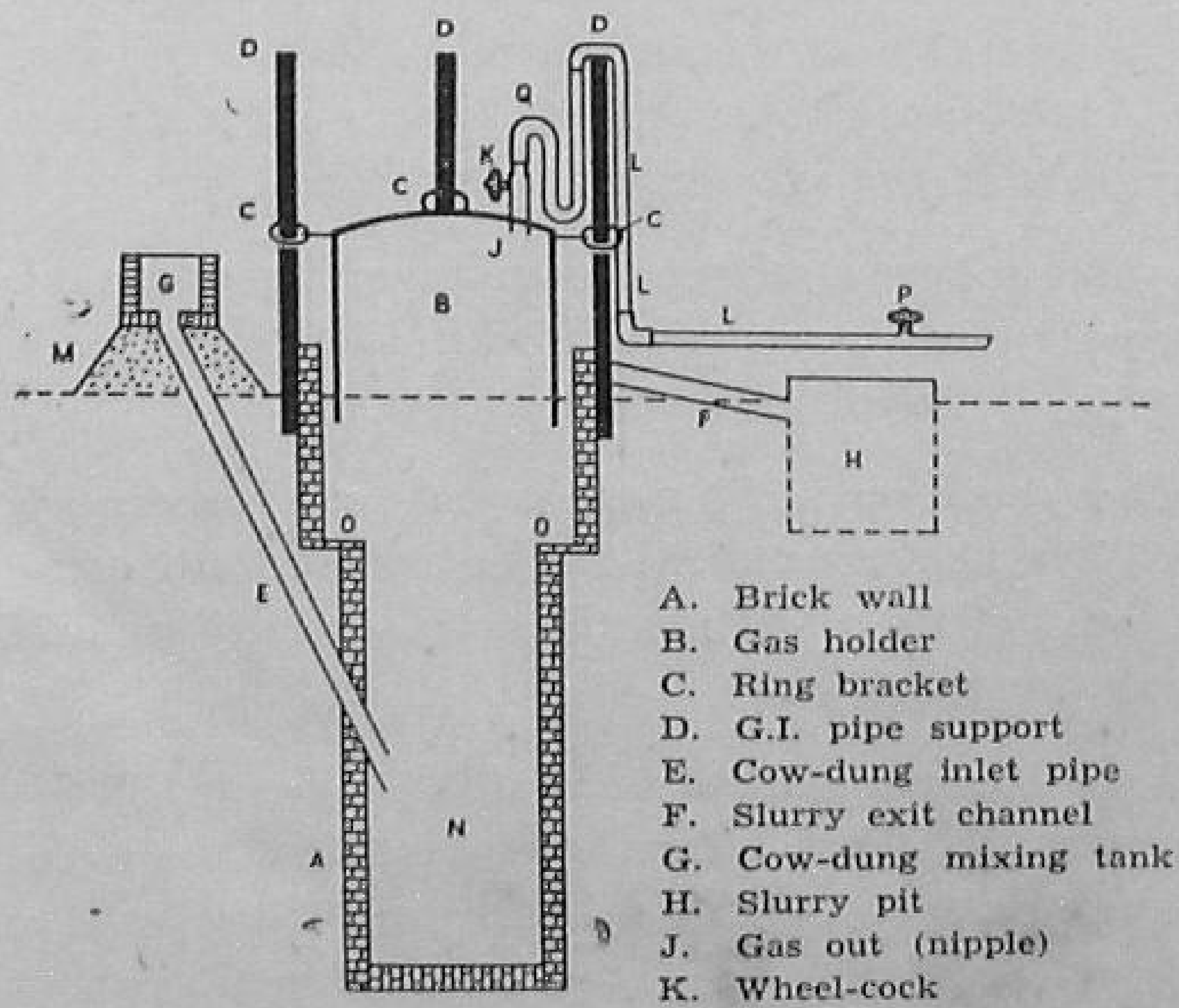
By passing the gas through a trap containing an enricher, more lighting hours can now be obtained

the drum while gas production is going on. When the gas is to be taken out for use, all bricks have to be removed from the boxes so that the drum releases the gas under the pressure of its own weight. After use, the bricks are again loaded in the boxes. This arrangement makes for a somewhat higher gas production under reduced pressure—of the order of ten to 15 per cent—though the loading and unloading of bricks proves rather cumbersome. Two alternatives to this arrangement are: three brackets welded on the top at equal distances, with suitable pulleys at the end, adjusted to move in their grooves along the fixed 1½-inch pipe supports fixed outside the well to keep the drum in position and always ready to receive or release gas; or three straight brackets with two-inch diameter clamp-rings at the end, welded on the top of the drum—the rings are clamped round the 1½-inch pipe supports, along which they can freely move up and down, keeping the drum in position.

bend is fixed at the other end of the cock to which the hose-pipe is attached. The wheel-cock remains closed until the gas is actually used. So, no condensation of water in the pipe-line takes place and the entire arrangement for removing condensed water, as in the previous design, is dispensed with.

In the model at present in use, the gas-holder floating in the fermentation well is supported by wire ropes passing over pulleys on three vertical supports, with wooden boxes at the free ends. The boxes are filled with about ten bricks each partly to counterpoise

The improved cow-dung gas plant



A. Brick wall
B. Gas holder
C. Ring bracket
D. G.I. pipe support
E. Cow-dung inlet pipe
F. Slurry exit channel
G. Cow-dung mixing tank
H. Slurry pit
J. Gas out (nipple)
K. Wheel-cock
L. Hose pipe
M. Earthen platform
N. Fermentation tank
O. Ledge
P. Gas tap

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FORD FOUNDATION REPORT
ON
INDIA'S FOOD CRISIS AND STEPS TO MEET IT

Prepared by the American Team of Agricultural Specialists who visited India at the request of the Ministry of Food and Agriculture and the Ministry of Community Development and Co-operation, with the sponsorship of the Ford Foundation, this Report contains concrete suggestions that will help India realise the Third Plan target of 110 million tons of foodgrains by 1965-66.

The Report is divided in three parts. Part I deals with the need for emergency measures, Part II with action highlights enabling village farmers to increase production by better economic and administrative arrangements and better use of physical and biological resources, and Part III with planning for an abundant agriculture. It is a report which needs serious study by all those who are interested in India's food problem.

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GINGER EARNS GOOD INCOME FOR THE WEST COAST

by
Sundaram Meenakshi

IN 1953, it was estimated, India accounted for 54,000 hundredweights in the world production of 1,33,000 hundredweights of dry ginger. Indian ginger goes to no less than 56 countries and in 1954-55 and 1955-56 ginger exports were valued at Rs. 13,99,640 and Rs. 11,40,569, exclusive of the coast-wise trade. It may be interesting to know that the bulk of these exports were from the West coast, where the ginger grower realizes a net per-acre profit of Rs. 500 to Rs. 600.

Ginger is cultivated as a rain-fed crop in the heavy rainfall areas of the West Coast, *i.e.*, Malabar in Kerala State and South Kanara in Mysore State. It is also grown as an irrigated crop in areas of moderate rainfall. In Tanjore in Madras State and Godavari in Andhra Pradesh, small areas are put under the crop with irrigation to produce green ginger for pickling. It is cultivated in the plains of Bombay and Bihar, and can also go up to altitudes of 5,000 feet, like the slopes of the Himalayas.

The areas under ginger in Malabar and South Kanara districts—two important ginger-growing tracts of the West Coast—are 10,340 and 1,050 acres, with an annual production of 66,000 and 7,400 hundredweights, respectively; the Nilgiris and Madurai of Madras together account for 230 acres, yielding 1,600 hundredweights.

Ginger grows well in heavy laterite loam free from gravels. In parts of South Kanara, it is also raised in sandy loams. In Malabar, it is grown under somewhat similar conditions of soil and climate. Elsewhere, clayey soils with drainage facilities are preferred. Soils in which turmeric thrives are also suitable for ginger, provided some shade is given.

On the West Coast, ginger is cultivated on high lands. Farmers in Malabar follow these rotations: ginger in the first year in the months of May to December—*modan* rice in the second year in the months of May to August—gingili as a second crop in the months of September to December; *samai* (*Panicum miliare* Lam.) is grown in the third year from September to December—afterwards the land is left fallow—and then it is prepared for cultivation of ginger in the following year.

The systems of cultivation adopted in Malabar and South Kanara, however, differ.

IN MALABAR

In Malabar, five or six ploughings are given in April, taking advantage of the summer showers, so as to bring the land to a fine tilth. Beds ten feet long and three feet wide are then formed one foot apart. Narrow beds are formed on steep slopes and wider beds on moderate slopes. The seeds are planted in small, shallow pits formed in the beds nine inches apart either way.

During May, a mixture of cattle manure and ash consisting of eight to ten tons of the former and 2,000 pounds of the latter is applied to each pit or hole. Bits of ginger weighing half an ounce and with two sprouts each are placed in each hole and covered with soil. The seed-rate adopted is 800 to 1,200 pounds per acre.

The beds are then provided with a thick mulch layer of green leaves of nux vomica at the rate of about 1,000 pounds per acre; this guards against washing out of the soil during heavy rains.

Sprouts appear in about a fortnight and germination is completed in about three weeks. Excess water is drained off by small waterways or channels.

When the crop is 1½ months old, one weeding is given. The beds are mulched again and earthing done. At the end of the third month, a third mulching and earthing are given.

The crop comes to harvest about December, when the leaves start withering. The dry twigs lying about the plants are removed. The rhizomes are lifted with a spade and digging fork. They are cleaned free of adhering soil and roots.

At the time of harvest, good rhizomes are selected with care for use as seed for the next year. The seed

is preserved in small pits which are dug under shade. The mouth of the pit is closed with a plank, leaving some empty space, plastered with mud and closed. Sometimes, a small hole is provided for aeration. The pits are opened just before sowing in May, when the rhizomes will be found fully germinated and ready for planting.

IN SOUTH KANARA

In South Kanara, as in Malabar, the land is ploughed up four to six times just after the April showers, and the soil brought to a fine tilth. Just before the onset of the monsoon, in May, a mixture of four tons of powdered cattle manure and two tons of burnt earth per acre is applied in lines about four feet apart in the form of a layer two inches thick to form ridges.

Planting is done on these ridges which are about eight inches high, as against the Malabar system of planting in raised beds. Rhizome bits weighting about one ounce to 1½ ounces each are planted a foot apart in a line. Earthing is then done.

A second earthing is done about four weeks later, in the sixth-leaf stage, after again applying a dressing of burnt earth at one ton per acre. Now the ridges are about 16 inches high. A third earthing is given after an application of about one ton of burnt earth ; the ridges are now about two feet high. No mulching is given. In respect of manuring, the difference between the Malabar and the South Kanara methods is that, in the latter, application of burnt earth is an additional feature, besides initial manuring.

As in Malabar, the crop comes to harvest by December, when the leaves begin to dry up. The crop is harvested in three stages. A small portion is harvested in September, when the crop is tender, and sold for the preparation of ginger preserves. The major portion is harvested in December and sold in the green state. The green produce is mostly shipped to Bombay.

The seed material is obtained from the portion of the crop harvested in February. The produce is said to mature by then. It is packed loosely in baskets and kept on a platform in the open, under shade. Precautions are taken against white ants. This method is said to be better than the Malabar method, for the seeds keep well and the rhizomes develop good sprouts by the end of May, which is planting time.

Ginger yields about 8,000 to 10,000 pounds per acre. During curing the produce is reduced to 1,600 to 2,000 pounds.

CURING

The outer layer of ginger rhizomes forming the skin is scraped off with split bamboos which are sharpened at one end to a knife point. Steel knives are not used because they stain the produce. The rhizomes are washed in water and dried in the sun for a week.

As the colour of the dry ginger is dull and unattractive, there is no ready market for this crude product. Dry ginger intended for export has to be cured very carefully. It must be white and free of spots and specks. Cleaned raw rhizomes are bleached before drying. They are soaked in water for a day and later in thick milk of lime. Afterwards, the material is dried in the sun for about ten days. It is turned occasionally for uniform drying. The dry ginger is then rubbed

Ginger plants showing rhizomes

against gunny pieces and the remnants of the skin removed. This also gives a smooth finish. In some places, there is a demand for a completely bleached product. To meet this requirement, the raw rhizomes which are treated with lime water are placed in bamboo trays before drying in the sun and treated with sulphur dioxide fumes for about 12 hours. (Sulphur dioxide is produced by burning sulphur in specially-constructed rooms). This makes the ginger quite white and attractive. The dry ginger is finally graded according to colour and size, and marketed.

MAKE YOUR CATTLE PAY DIVIDENDS

by

Gian Singh *and* **Gurcharan Singh**
Division of Agronomy
Indian Agricultural Research Institute
New Delhi

IF in Australia and New Zealand, a livestock farmer makes anything from Rs. 12,000 to Rs. 15,000 per year, why does his counterpart in India get only about Rs. 200 from a similar holding? The answer is that the condition and performance of our livestock are generally poor. Not that Indian cattle do not have the right genetic make-up to be good producers; only, it has to be properly exploited.

Livestock farming in our country certainly needs to be put on a better footing. Millions of our farmers have holdings too small for an economic use of machinery, so they have to bank upon bullock power. Further, milk is the main source of animal proteins for our predominantly vegetarian population. Livestock on a mixed farm also improve soil fertility, provide workers steady employment throughout the year and make possible a good use of farm wastes like *bhusa*.

For dairy farming and livestock breeding to be really paying, the animals have to be good yielders, easy milkers and regular producers. Also, a good cow or buffalo must calve at intervals of 12 to 15 months, which should include nine to ten months of milking and three to five months of dry period. She should give birth to at least seven or eight calves during her lifetime, and should not remain dry long, after giving a good quantity of milk for one or two lactations; in fact, the income from the first two lactations hardly covers the cost of rearing the animal up to maturity (first calving), and it is the subsequent lactations that provide the expected profits. Lack of any of these qualities lowers the economic value of an animal.

ADEQUATE FEED

Coming to the feed of dairy animals. It has to include adequate quantities of carbohydrates, proteins, fats, minerals and vitamins. It should, therefore, consist of oats 35 per cent, bran 15 per cent, groundnut cake 20 per cent, linseed cake ten per cent and gram 20 per cent; in addition, two per cent salt, one per cent chalk and 1½ per cent of mineral flour are also necessary.

This concentrate mixture should be fed at about a pound for every three pounds of milk given by the animal. A good dairy animal should also get about 20 seers of green and three seers of dry fodder per day for vitamins and bulk. The bulls can be given four to six pounds of the mixture and about 20 seers of green and about three seers of dry fodder. New-born calves should be fed milk for about six months, and thereafter given two to four pounds of the concentrate mixture and a good quantity of roughages. A dry animal should be given two to six pounds of the mixture, depending upon its size and quality. With proper feeding, a young female will calve at the age of 2½ to three years and a male will start giving service at two years, and that is what the aim should be.

PROPER BREEDING

Of equal importance is proper breeding. Scientific breeding, however, takes longer to show results. Efforts should be made to mate the cow within three or four months after calving with a bull whose mother and daughters have given high yields of milk rich in fat. All the scrub bulls should be got castrated. As there is a great paucity of pedigree bulls, full advantage should be taken of the technique of artificial

Hajamba

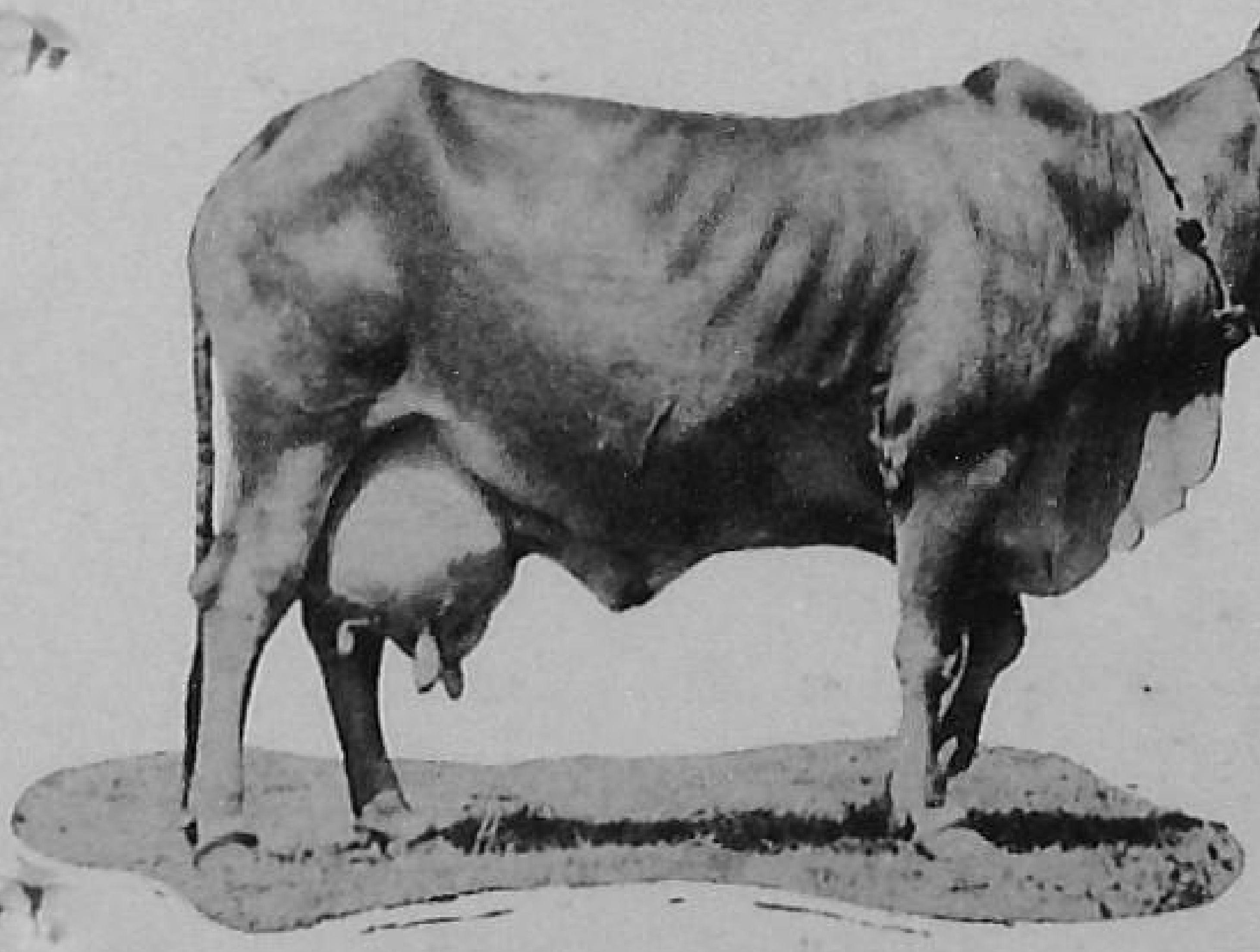
insemination which has helped many countries improve their livestock within a short time.

GOOD MANAGEMENT

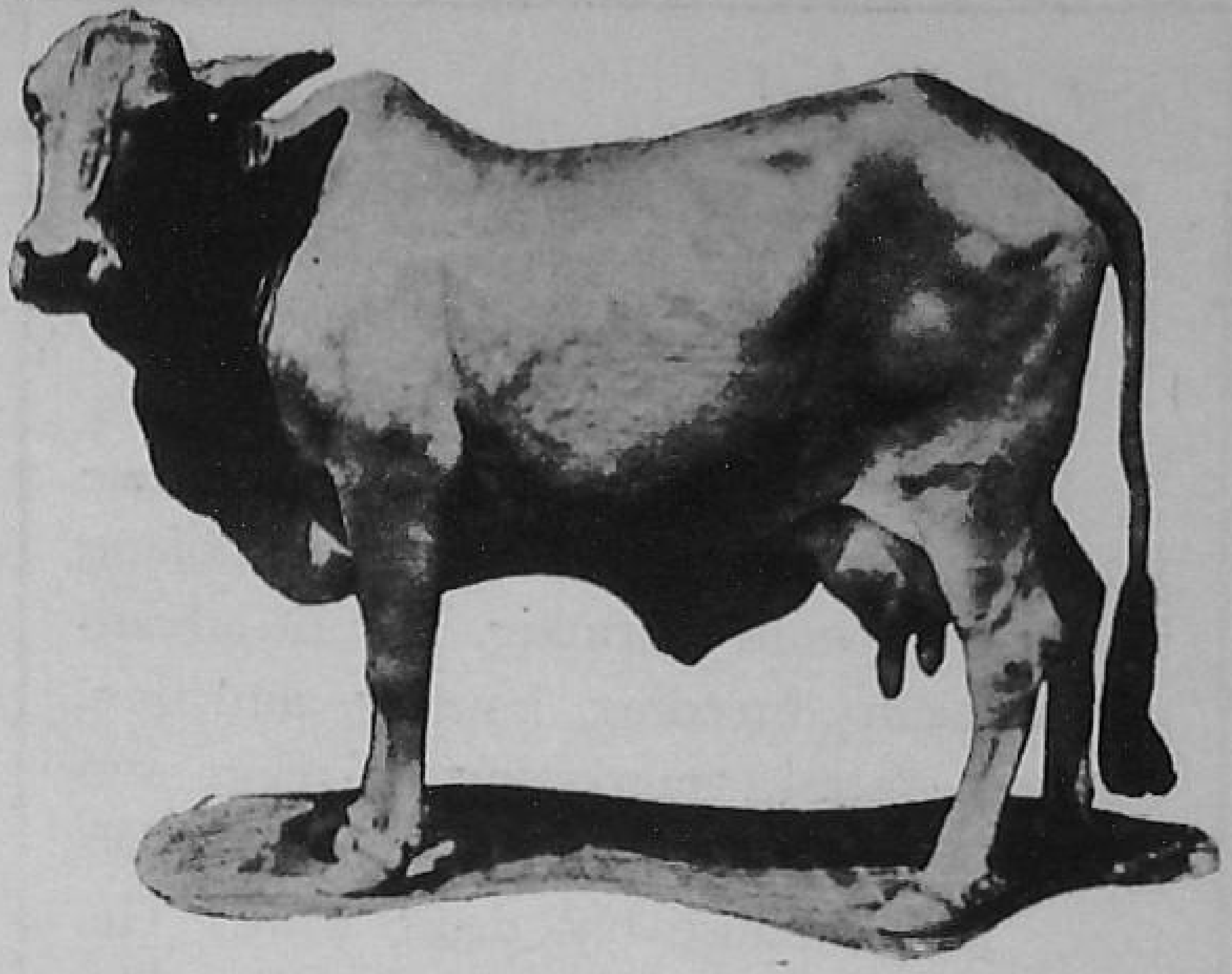
Good management includes provision of open and airy sheds to the dairy animals to protect them against extremes of climate; grazing lands for nutritive pasturage and for exercise; separate pens for breeding bulls, where they can move about freely; community milking-sheds and watering troughs; and proper storage and handling facilities for milk and its products.

Protection against common contagious and venereal diseases like rinderpest, foot and mouth, black quarter, haemorrhagic septicaemia, anthrax and contagious abortion, is very important. Efficient vaccines against these diseases are now available and cattle owners can get their animals vaccinated mostly free of charge. The vaccination should be carried out a fortnight before the onset of the rains when the germs become more active. Against contagious abortion, the animals should be vaccinated when quite young—before they have started breeding. Strict hygienic measures at calving time go a long way to reduce the after-birth infection which ruins the breeding capacity of the females.

Nedraee



A Sahiwal herd of pedigree cattle is being maintained at the Indian Agricultural Research Institute, New Delhi, on the above lines. The herd was founded at Pusa (Bihar) in 1904 and shifted to New Delhi in 1936. It has been possible to induce in this herd regular breeding over a long period and high milk yields. Several cows belonging to the herd lived for over 12 years and gave birth to eight or more calves. Records of three outstanding cows of the herd are given below.



Panarbilla

Nedraee. She was born on 24th April, 1944, is at present 14 years old, has completed 11 lactations, giving a total milk yield of 78,022 pounds, and enjoys good health. The details of her performance are as follows.

Lactation		*Date of calving*	*Milk yield in ten calendar months (in pounds)*
First	..	23.10.1946	5,989
Second	..	20. 5.1947	673(Abortion)
Third	..	5. 4.1948	9,437
Fourth	..	12. 4.1949	8,629
Fifth	..	14. 5.1950	8,166
Sixth	..	10. 8.1951	7,988
Seventh	..	7. 8.1952	5,483
Eighth	..	15.10.1953	7,333
Ninth	..	1.12.1954	8,461
Tenth	..	9. 1.1956	8,725
Eleventh	..	17. 1.1957	7,229
		Total	78,022 (or 952 maunds)

The total value of milk produced at annas nine per seer comes to Rs. 21,420.

Panarbilla. Born on 13th September, 1945, at present 13 years old, has completed nine lactations, giving a total milk yield of 74,815 pounds, and is in

Just Published

POULTRY-KEEPING IN INDIA

by

P. M. N. Naidu

It offers reliable, helpful and up-to-date information on the numerous problems involved in poultry farming. Recent advances in poultry breeding, housing, nutrition, disease control, marketing of eggs and poultry (and increasing efficiency of production) are exhaustively dealt with. The discussion on marketing of eggs and poultry from the producer's standpoint is exceptionally comprehensive.

Written in a popular style and profusely illustrated, the book will enable the poultry-keeper raise healthy stock and market the produce economically and profitably. It will be useful to students of poultry husbandry, poultry farmers, Extension workers and government officers.

CONTENTS

Preface; Poultry in India; Breeds and varieties of chickens; Choosing a breed; Structure of the fowl and formation of egg; Poultry breeding—Principles and Practices; Culling of poultry; incubation and hatching; Brooding and rearing; Housing and equipment; Feeding principles and practices; Diseases and their control; Management; Marketing; Bibliography; Index

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NEW DELHI—2

good health. She is again in calf for the tenth time. Her performance is as below.

Lactation		*Date of calving*	*Milk yield in ten calendar months (in pounds)*
First	..	28. 2.1948	5,734
Second	..	20. 2.1949	8,372
Third	..	6. 4.1950	9,662
Fourth	..	26. 5.1951	7 662
Fifth	..	26. 9.1952	10,173
Sixth	..	6.12.1953	9,441
Seventh	..	6. 9.1955	8,642
Eighth	..	11. 5.1956	7,105
Ninth	..	31. 3.1957	8,063
		Total	74,815 (or 912 maunds)

The total value of milk comes to Rs. 20,520.

Hajamba. Born on 27th October, 1944, is at present about 14 years old, has completed ten lactations giving a total milk yield of 78,323 pounds. She is again in calf for the 11th time. She is in good health and the details of her performance are as below.

Lactation		*Date of calving*	*Milk yield in ten calendar months (in pounds)*
First	..	17. 2.1946	7,577
Second	..	3.11.1947	3,931 (in 293 days)
Third	..	7.12.1948	8,521
Fourth	..	24.12.1949	9,029
Fifth	..	14.11.1951	9,505
Sixth	..	11. 2.1953	9,696
Seventh	..	25. 5.1954	7,776
Eighth	..	2. 6.1955	7,587
Ninth	..	1. 7.1956	6,898
Tenth	..	16. 6.1957	7,803
		Total	78,323 (or 955 maunds)

The total value of milk produced comes to Rs. 21,500.

At present, a fairly large proportion of the 20 crores of our cattle is below the mark. Such cattle not only cause congestion, thereby spreading disease, but the feed and labour spent on them are also a waste. Our farmers should, therefore, rear only good animals, maybe few in number, but productive. The proper place for useless and unproductive animals is a *gosadan* and not a dairy farm.

WHAT'S NEW IN FARMING

"ENDRIN" FOR CASTOR SEMILOOPER

RECENT experiments in Hyderabad have shown that the castor semilooper can be completely controlled by using "Endrin," and at a cost of less than 11 rupees an acre.

An ounce of this chemical is mixed in four gallons of water and sprayed on the crop. The first spraying is given in August, when 12 ounces of the chemical should be used per acre. This will cost Rs. 4.31. The second spraying is given after a month, using a pound of "Endrin," costing Rs. 6.44. With these two sprayings of Rs. 10.75 worth of the chemical per acre, you can save your valuable castor crop.

The semilooper is one of the worst enemies of the castor crop. It gets its name because it moves in loops. It is about 1½ inches long, ash-grey to dark-grey in colour when fully grown, and has two or three longitudinal stripes or bands on its back.

It feeds on the leaves, tender stems, blossoms and even on the tender fruits of the castor plant. When the attack is severe, only the skeletons of leaves are left behind.

The castor semilooper generally appears in August, and continues to damage the crop till November. It does the worst damage in September-October.

TIMING COCONUT HARVEST

WHAT is the best stage at which to harvest coconuts for use as tender nuts, as copra, as ball copra, and for green husk ?

Studies made for a number of years at the different Coconut Research Stations point out that tender nuts are best harvested when they are six to seven months old. It is at this stage that there will be the maximum of nut-water and sugar.

Where nuts are to be harvested for making copra for extracting oil, harvest them only when fully mature. They will give the maximum quantity of the best-quality copra.

If you intend making ball copra, better retain the nuts on the trees till they are overmature. When one or two nuts in the bunch fall off of their own accord, harvest the rest.

Where green husk fetches a good price, you would want to harvest nuts earlier. Do it a month before nuts are fully mature, that is, when they are 11 months old. The higher price obtained for the husk will compensate for the smaller quantity of copra produced from such nuts.

LONGER IMMUNITY AGAINST H.S.

A NEW vaccine against Haemorrhagic Septicaemia developed at the Institute of Preventive Medicine, Ranipet, Madras, now confers immunity on cattle and buffaloes for as long as one year ; the vaccine used until recently did so only for six to eight weeks. Another vaccine effective against both Haemorrhagic Septicaemia and Black Quarter has also been evolved. The work was undertaken at the Institute under a scheme sponsored by the Indian Council of Agricultural Research.

Haemorrhagic Septicaemia is a contagious disease affecting mostly cattle and buffaloes. It is generally met with in low-lying areas, and during the rains. The symptoms, briefly, are: high fever, difficult

breathing and swelling under the jaw. The death-rate is nearly a hundred per cent.

NEW COTTONS

THE Indian Central Cotton Committee recommends the following three improved varieties of cotton for the tracts noted against each :

Long-staple American Strain *LL. 54*	Central and submontane districts of the Punjab
The American Strain *A. 51-9*	Western Minar tract of Madhya Pradesh
Gaorani-46	Marathwada area

Australian Farmers Speed Up Mechanization

MECHANIZATION has greatly influenced nearly every branch of agricultural production in Australia, and many specialized types of machines are in general use. As a result, the number of man-hours required for a given quantity of output on a farm has decreased, and a generation of machine-minded farmers and farm workers is replacing the more horse-conscious older generation.

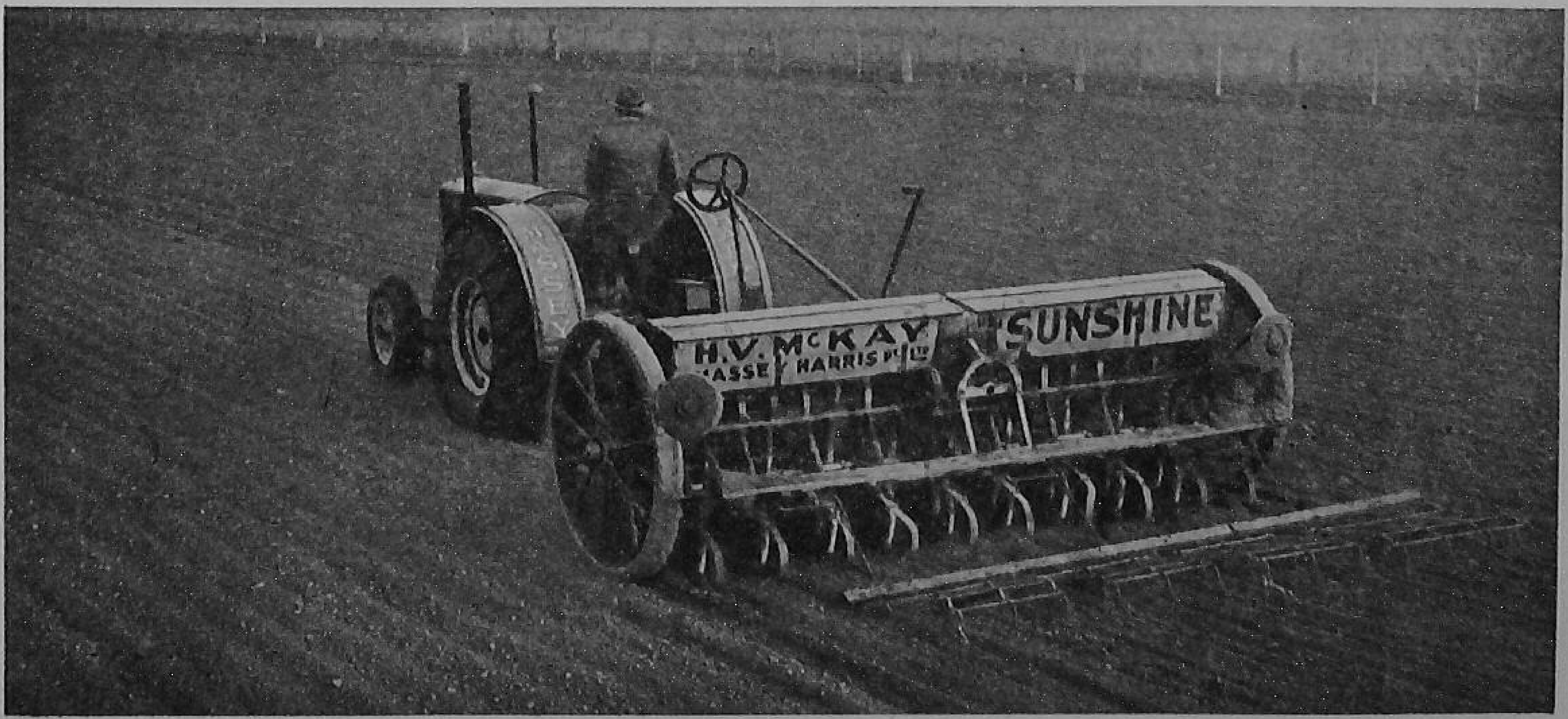
The manufacture and use of agricultural implements in Australia dates from the time the local blacksmith made at his forge simple equipment for the early settlers. Today, the smithy has almost ceased to operate as a source of agricultural implements, and Australian agricultural implement manufacturers include large enterprises with a world-wide reputation, making a very wide range of implements and machines. The invention of machines for large-scale tillage, sowing and harvesting has in turn rendered possible the vast development of primary industries on large tracts of relatively low-yielding land.

Four broad categories of agricultural machines are produced and used in Australia: tillage implements, seeding and planting implements, harvesting implements, and an extensive range of miscellaneous equipment for the farm. The tillage implements include ploughs, harrows, cultivators, soil-stirrers, hoes and weeders. Combines, drills and planters are chief among the seeding equipment. The harvesting machinery includes header and stripper harvesters, reapers and binders; mowers and hay-making implements such as balers, presses and rakes are others. The miscellaneous group includes equipment such as milking machines, shearing machines, inter-row cultivators, automatic hay loaders, potato diggers, chaff-cutters and feed grinders, pumps and irrigation equipment and fertilizer spreaders. In addition, the manufacture and assembly of tractors is an important activity with some manufacturers.

AUTO-HEADER

For large-scale grain harvesting, the auto-header has come into fairly wide use in recent years. A

A farmer in Wimmera district, Victoria, sows wheat with an Australian-made combine of 18 rows and 37 tines, with a forward screw-lift and a stump-jump smoothing harrow behind



12-foot or 14-foot auto-header can harvest five acres or more per hour. A 14-foot auto-header has been known to harvest as much as 3,300 bushels of grain in a 16-hour day on a Victorian farm.

The tillage implements vary in design and size to meet the differing farming conditions and acreages. In Australia, the disc plough shares equal favour with the old mould-board implement. The seeding and planting implements include the tractor-drawn combine drill planter which is used for sowing most of Australia's seed crops. The combine sows the seed and spreads fertilizer in a single operation. There are also other combine planters for sugar, cotton, maize and potatoes.

The greatest pioneer of mechanized agriculture in Australia was Hugh McKay, a farmer's son of Bendigo, Victoria. His first invention was a machine to winnow wheat, in place of the then commonly-used Ridley stripper, a horse-drawn machine which required the arduous labour of two men to operate. Four new mould-board and three disc-plough models were then produced by the factory set up by him. Sun grain and fertilizer drills were made in great numbers 1907 onwards. In the same period, McKay introduced the one-way disc cultivator, the first of the big disc-cultivators to bring stony or stumpy land into quick production of grain.

A single-row mechanical sugarcane harvester of Australian design in operation in the McKay district, centre of the Queensland sugar industry. Mounted on a tractor, its two slanting arms guide the cane to two circular knives which cut it above the roots. The propeller whirling in the circular shield above lops the tops, and the stalks are laid in a line behind the machine as it moves

In 1916 and 1917, three important machines were introduced. They were the "Sundercut"— a combination of stump-jump cultivator and plough, the "Suntyne"—combined grain and fertilizer drill and tine cultivator, which quickly became Australia's most popular seeding machine, and the "Sunshine" header (combined harvester)—recently acknowledged by an American technical journal as the basis of modern world harvesting machinery practice. The header was the invention of Headlie S. Taylor.

ROTARY HOE

A machine that ploughs, harrows and cultivates in one operation was also the invention of an Australian farmer. The machine, a rotary hoe, introduced rotary tillage—a method of cultivation which has become popular throughout the world. The inventor was A.C. Howard, a wheat farmer, who 30 years ago designed the first rotary hoe. Many improvements have since been made on his first machine. The hoe is a series of specially-designed, steel hoe blades attached to a cylinder. When rotated, the blades slice through the earth and throw the clods to the rear of the machine.

Although they are not interchangeable, hoes are made in varying widths from 14 inches up to huge tractor-driven models with a five-foot six-inch cut. Some are designed for large cereal crops, others for smaller farms and orchards, and a small, low horse-power model for market gardening. With the exception of the latest trailing hoe, all Howard rotary hoes are self-propelled. The hoe is an integral part of the power plant, a 37 b.h.p. Howard tractor. The smallest unit is a 4.2 h.p. "Terrier" powered by a single-cylinder engine. It has a 14-inch cut, and is popular on small farms, market gardens and orchards, for cultivation between rows; it breaks up new ground or prepares old ground for new crops. The "Terrier" can also be fitted with special attachments such as a sickle-bar mower to cut grass and crops, and a tool-bar to attach tine tools, furrowers and spray equipment.

Other models differ mainly in horse-power and width of cut. The trailing hoe has a cutting width from five to nine feet and is designed for larger farms. One of its main advantages is that it can be drawn by high-power tractors with standard power take-off and can be detached, so that the tractor may be used for other

tasks. The rotor-flange is rotated by a transmission shaft attached to the power take-off.

Spectacular results have been claimed by farmers using the rotary hoe in preference to a plough. In New South Wales, a wheat farmer was unable to prepare his ground for sowing because of extremely heavy rainfall. The ground was too soggy for a disc or mouldboard plough. He broadcast the seed over the unprepared ground and turned it in together with the abnormal growth of weeds and the stubble from the previous crop with the trailing rotary hoe. It was not a perfect crop, but he was the only farmer in the district who obtained a profitable crop.

CHISEL PLOUGH

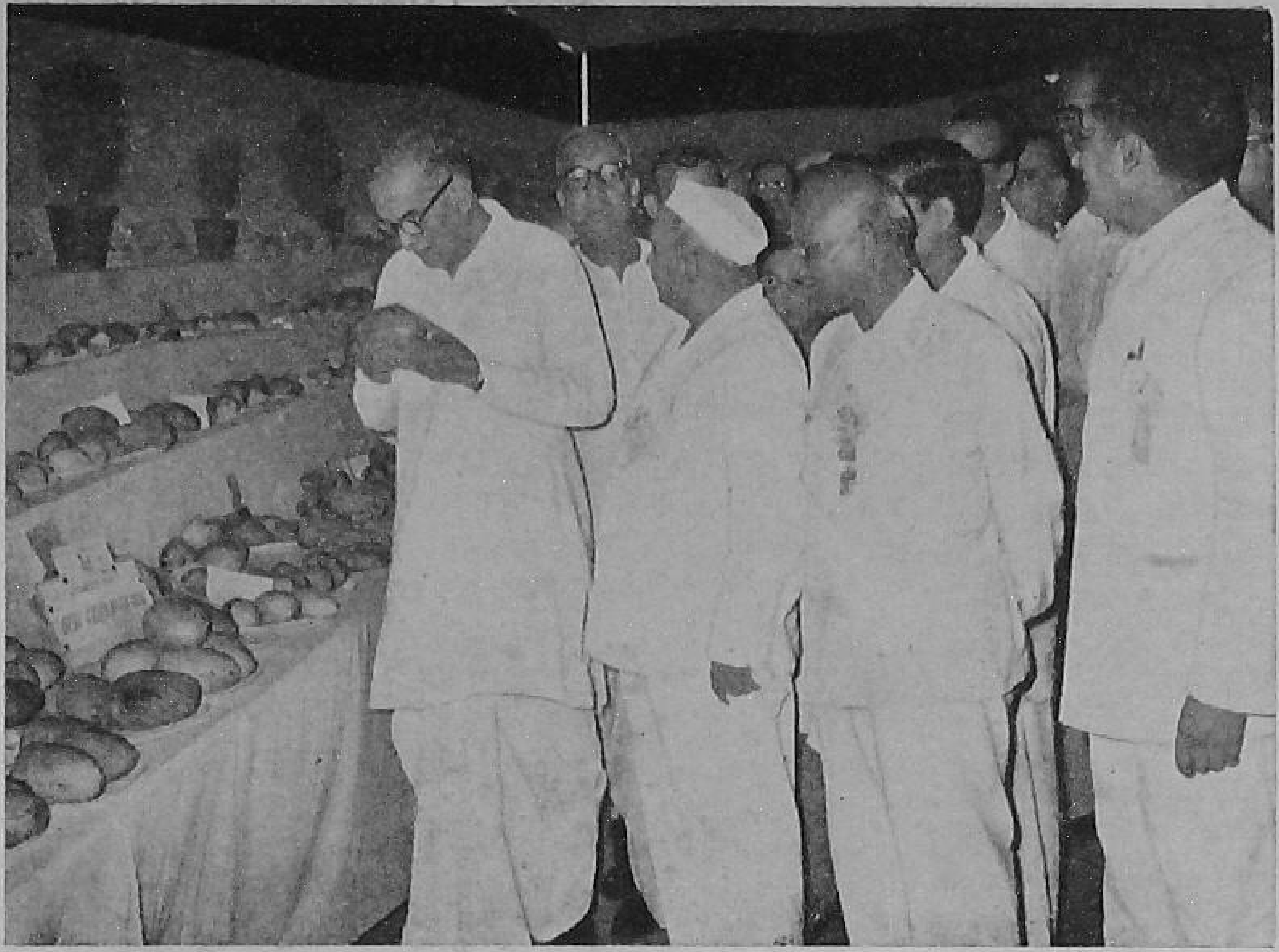
A revolutionary plough—the "Connor-Shea" chisel plough, designed and made in Australia on an entirely new principle, has been hailed as the ideal implement for stubble mulch farming and to prevent soil erosion. With widely-spaced, special alloy steel tines, to which a variety of attachments for use in different soil conditions are fixed, this plough leaves 40 per cent more organic matter in the surface soil than any other plough. Because of its many tine fittings and its ability to effectively plough strips up to nine feet wide and cultivate up to 13 feet, the implement saves time and reduces farming costs.

The principle behind the "Connor-Shea" chisel plough cultivation is simple. Instead of constantly turning over the topsoil, which soon becomes dry and powdery and aids wind in erosion, the chisel plough bursts through the hard "pan" caused through years of shallow conventional cultivation. By this means, the flow of water to low-lying parts, even after heavy rainfall, is stopped, because the moisture can penetrate to the subsoil without a harmful run-off.

Very little subsoil is brought to the surface. The good topsoil is left porous, but not powdered. For stubble mulching, the chisel plough retains the humus at the surface, where decomposition is most rapid. The implement has been successfully employed to reclaim land and to prevent erosion by ploughing at right angles to the flow of water. It is highly mobile because it is mounted on pneumatic-tyred, ball-bearing wheels.

CONTD. ON PAGE 22

A mechanical potato digger at work on a farm in Australia. Combine planters for potatoes sow and spread fertilizer simultaneously



Spotlight On Farm News

Calcutta Mango Show

OVER 50,000 people visited the Second All India Mango Show for the Eastern Zone organized by the Indian Council of Agricultural Research at Ranji Stadium, Calcutta, on 13th and 14th June, 1959. The variety *Imam Pasand* was adjudged the Best Fruit of the Show, and its exhibitor, Shri B. P. Raju of West Godavari District, Andhra Pradesh, was awarded a Silver Cup.

Picture shows Dr. B. C. Roy, Chief Minister of West Bengal, who gave away the prizes, appreciating the Best Fruit of the Show.

Shade For Hogs

A RECENT study by the United States Agricultural Service has revealed that hogs can be kept cooler in hot summer weather by using shelters roofed with white-coated film of Union Carbide polyethylene in convenient wooden shades. Hogs must be kept as cool as possible to obtain fastest weight gains and eliminate costly extra feeding. In the tests, hogs were seen to ignore the wooden shelters completely and crowd under the polyethylene shades.

The polyethylene film type shelters were built using frames of scrap, and lumber posts were set to support the rectangular structure. Eighteen-foot long, two by six inch supports were nailed to the posts with gate panels normally found on farms placed atop the frame over which the polyethylene film was rolled. Film of 0.01 inch thickness was used. It was black polyethylene with a coating of white. To help reflect heat, the film was placed white side up. Field tests indicated that such structures might last three or four years.

Compost From Tobacco Waste

VARUNA village of Mysore taluka has found a new use for *bidi* tobacco scrap and waste: for making compost.

Last summer, water-melons and cucumbers in the village were manured with a mixture of tobacco scrap compost and lime in a six per cent ratio at a rate of about two pounds per pit. The crop growth was excellent and there was no sign of pests and diseases, as compared to the previous year, when farmyard manure was used. The yield per acre: 8,575 water-melons and 10,325 cucumbers.

Tobacco waste stalk applied along with green manure to paddy grown on a light clay soil also gave good results. The per-acre yield was 1,480 pounds, as compared to 1,460 pounds with green manure alone. The percentage of unfilled grains was also lower than in the plots receiving green manure alone.

—**Syed Nasiruddin**

CONTD. FROM PAGE 20 Australian Farming

Both fixed-tine and stump-jump models are available in a variety of sizes—nine feet and 13 feet for trailer models, or five, seven and nine foot three-point linkage models.

The cutting width of all the models is readily adjustable to suit the tractor power and the conditions of the ground to be worked. The tines are easily removed or reversed for this purpose. Owing to their disposition, the plough will not veer off course. It can be attached to a tractor by a swinging draw-bar. The three-point linkage models are suitable for attachment to all popular makes of tractors.

HARVESTERS AND LOADERS

The Australian sugar industry is making increasing use of mechanical harvesters and loaders. For 25 years, there have been experiments with mechanical aids, and today, four Australian-designed machines are operating very successfully in Queensland. They are the "Toft," "Fairymead," "Moloney" and "Kinnear." The latest of these is the Kinnear, which not only cuts and tops cane, but bundles it as well. It can be quickly disconnected from the tractor which draws it.

The "Kinnear" is mounted on four wheels and is about nine feet wide. It operates on the left-hand side of a field of cane, the tractor running just outside the first row of cane. The attached harvester, being wider than the tractor, takes the first row and cuts the cane off at the base by means of two shear knives set at an angle to each other. The cut stalks are guided into the machine in an upright position and are allowed to fall over towards the left-hand side of the harvester, the butts remaining in the same relative position as when growing. When the stalks have fallen to a position where the tops are about three feet from the ground, a topping-knife operated by a stationary engine mounted on the harvester frame severs the tops. The topped cane then falls to the ground and occupies a position at right angles to the original cane row.

Beneath the harvester is a series of tines which can be manually or automatically tripped. These bundle the fallen cane-stalks, and when the bundle is sufficiently large, the tripping device operates to start another bundle. The cane bundle is, however, in a position where it may be run over by the machine on its next round. To avoid this, a further set of tines set at an angle at the back of the harvester turns the bundle and places it beyond the reach of the harvester wheels when the next row is cut.

The "Kinnear" harvester is constructed of steel throughout. The topping engine is of three horse-power. The operator sitting on the machine controls the point of topping by turning a wheel which moves the topping-knife along a horizontal shaft. This adjustment, which is very rapid, allows for the variable lengths of the cane. Two men are needed to operate the machine—one for the tractor and the other for the harvester.

The "Toft" cane harvester is a self-propelled cutting and topping unit. It is mounted on three wheels, two at the rear and one in front. The front wheel is set to left of centre and provides the means of steering from a hand-wheel on the driving platform above. The unit is about 14 feet long—with a four-foot extension to carry the topping mechanism—and about nine feet wide, which enables it to operate after the first row of cane is cut. The cutting mechanism is carried by an arm extending from the framework to the right front, and is supported on a castor wheel. The complete operation provides for cutting, elevating, topping and tipping in bundles.

The "Fairymead" two-row cane harvester is a self-propelled cutting and topping unit, operating simultaneously on two rows of cane. In contrast to the Toft, which is designed primarily as a cane harvester the Fairymead unit is built on a wheeled tractor.

The "Moloney," too, has given good results, and can harvest about an acre an hour in a block of about 30 tons to the acre with fairly even growth. The machine travels parallel to a tractor. Two men working the tractor and machine and hand-loading the cane after it has been cut can do as much work as at least six men cutting and topping by hand.

IN QUEENSLAND

In the Queensland sugar industry, the general practice has been to hand-load cane stalks into trucks running on a movable two-foot tramway. This system of transport has somewhat delayed widespread adoption of mechanical loading because such loaders are best suited for dumping cane into long boxes mounted on motor trucks rather than into tramway trucks. Queensland growers have, however, made some use of three types of Australian-made mechanical loaders—the Toft, Fowler and Fairymead, all of the grab type common to the sugar industry throughout the world. A new development is a cane-loading device designed for farms which load cane first on to motor trucks, and not directly on to tramway waggons.

Previously the two-ton loads of cane had to be lifted by a winch-and-block tackle, operated by hand or by a petrol engine. But with a "Treacy" lift a winch is not needed. The device is operated by driving the rear wheels of the trucks on two sets of rollers. The gantry consists of heavy posts and one transom, as used for an endless-chain hoist. The load can be lifted the required height in ten seconds, while the driver can comfortably unload the truck, load the tram truck for dispatch and leave the loading area within five minutes.

Four Foreign Sweet Potatoes Beat Madras Locals

by
B. Seemanthani
Agricultural College and Research Institute, Coimbatore

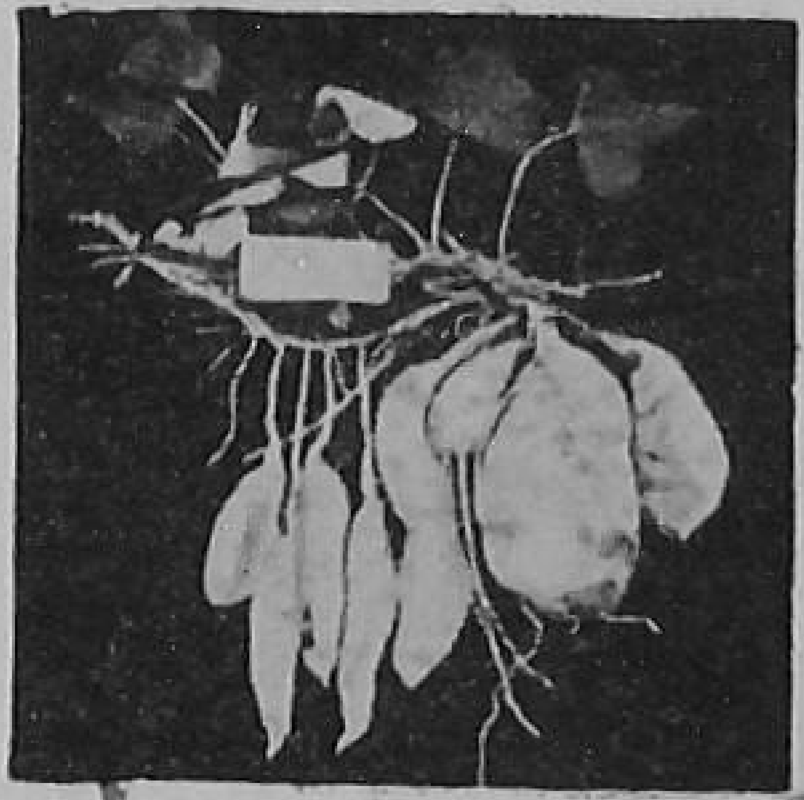
FOUR high-yielding sweet potato varieties for Madras State have been isolated from a collection of over 100 at the Coimbatore Agricultural Research Institute under a scheme partly financed by the Indian Council of Agricultural Research. They are: *V. 2* or *F. A. 17 White*, *V. 6* or *F.A. 17 Red*, *V. 8* or *F.B. 4004* and *V. 12* or *T.S.T. White*. All of them are introductions from abroad, and have proved superior in every way to the existing locals.

Sweet potato is cultivated over about 40,000 acres in the State, chiefly in South Arcot, Tiruchirapalli, Tirunelveli and North Arcot districts. To assess the performance of the new types in different parts of the State, trials were conducted for a few years with the first three varieties. The results were quite encouraging, the yield recorded by these varieties over that of the existing local varieties being, on an average, six to 25 per cent more. In certain cases, increases of up to 100 per cent were also recorded.

The results also indicated that the three varieties were equally promising in the districts of North Arcot and Tiruchirapalli. For South Arcot, *V. 6* and *V. 8* were found to be more suitable than *V. 2*, while for Madurai, *V. 2* and *V. 6* appeared promising. It was also seen that the variety *V. 2* was more cosmopolitan, being suitable for a wide range comprising the districts of North Arcot, Tiruchirapalli, Tanjore, Madurai and Tirunelveli. Efforts are now being made to multiply and distribute planting material of these varieties on a large scale.

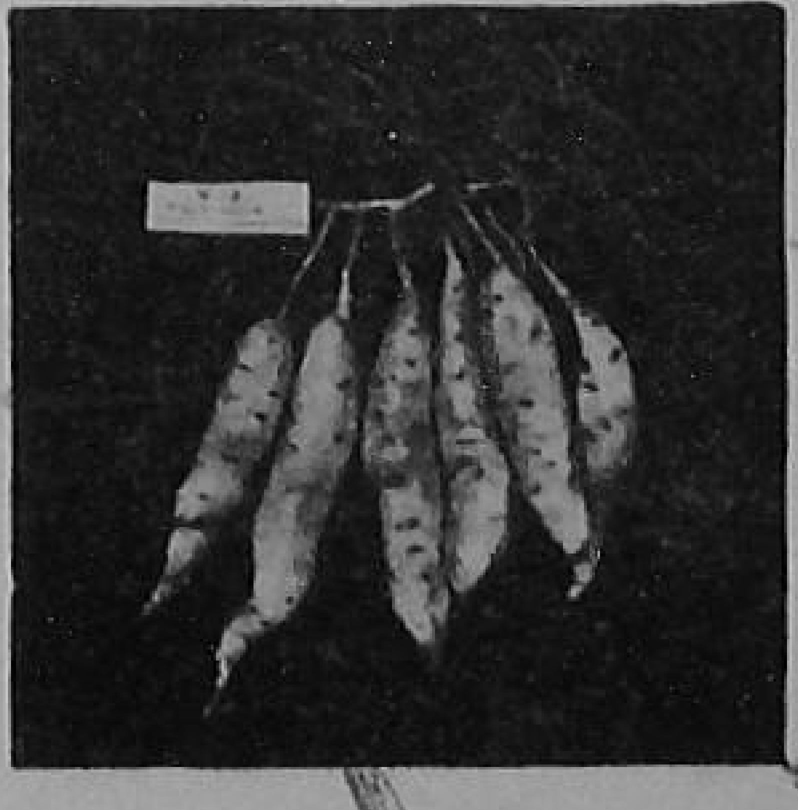
A brief description of these varieties, which were originally received from the Indian Agricultural Research Institute, New Delhi, is given below.

V.8 (F.B. 4004)



V.2 (F.A. 17 White)

V.6 (F.A. 17 Red)



V.12 (T.S.T. White)

V. 2 or F.A. 17 White

A Chinese variety of 4½ months' duration.

The vines are medium long and vigorous in growth in the early stages. The stem is thick, green and sparsely hairy. The leaves are slightly lobed. The nodes, petiole, junctions and veins on the undersurface of leaves are purple-coloured. The tubers are medium to big-sized, variable in shape, white-skinned and white-fleshed. The cooked flesh is creamy white, sweet and fibreless. Besides being an early type, it has the added advantage that the tubers are located very near the ground, facilitating easy harvest. It has recorded, on an average, increase in yield of 73 per cent over that of the local variety, the maximum yield recorded being 29,845 pounds per acre.

V. 6 or F.A. 17 Red

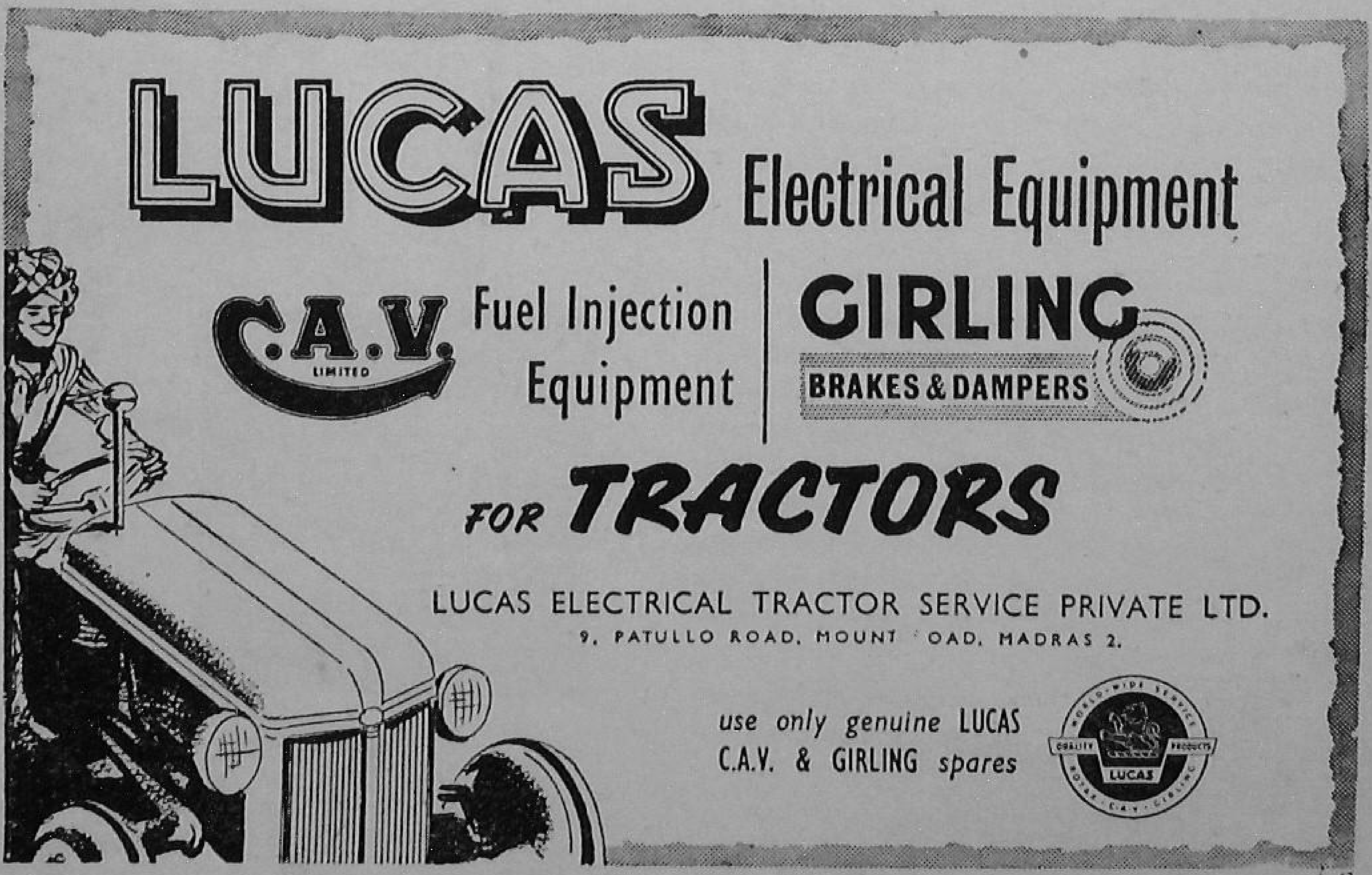
Another Chinese variety of 4½ to five months' duration. The vines are vigorous and moderately spreading, with semi-erect habit in the early stages of growth. The stem is black-purple, except at the terminal portions where it is distinctly green, medium thick and hairy. The leaves are slightly lobed. The leaf-stalks and the veins on the lower surface of the leaves are purple in colour. The tubers are medium to big-sized, of more or less regular shape and size, tending to become roundish at the apex, and red-skinned. The cooked flesh is yellow, sweet, sugary, smooth and fibreless. The variety has recorded a maximum yield of 27,538 pounds per acre and an average increase in yield of 39 per cent over the local variety.

V. 8 or F.B. 4004

An American variety with a duration of 4½ to five months. The vines are vigorous in growth and moderately spreading. The stems are round, medium thick, hairy and reddish purple. The leaves are not lobed. The tubers are big-sized and white-skinnd, with a light purple tinge at both ends. The cooked flesh is creamy, sweet and non-fibrous. The variety has recorded a maximum yield of 31,266 pounds per acre and an average increase of 61 per cent over that of the local variety.

V. 12 or T.S.T. White

The variety is of Chinese origin and has a duration of 4½ to five months. The vines are vigorous and greatly spreading. The stem is thin, green and sparsely hairy. The leaves are not lobed. The tubers are medium to big-sized, elongated, of uniform size and shape and light brown in colour. The flesh is cream-coloured with a light purple tinge which is more prominent in immature tubers. The cooked flesh is creamy, sweet, delicious and non-fibrous. The variety has recorded a maximum yield of 29,137 pounds per acre and an average increase of 43 per cent over the local variety.



WHY NOT COMMERCIALIZE THE CHOCOLATE TREE?

by

K. Fazlullah Khan

Cashewnut and Spices Development Officer, I.C.A.R. Ernakulam

This is how cacao bears fruit

ISN'T it strange that although we consume considerable quantities of various cocoa products, we have not yet commercialized the cacao, also called the 'chocolate' tree, that provides the raw material for these products? Result: almost all our requirements have to be met by imports from foreign countries, which means a drain on our foreign exchange resources. The question naturally arises, "can we not grow the chocolate tree in our own country?"

Sure, we *can*. Experimental cultivation of the tree has been carried on in South India for a few decades now. In Madras State, the Subtropical Fruit Research Stations near Mettupalayam, have successfully raised the trees on a small scale. Some enterprising private growers in Kerala State near Trichur have also succeeded in raising this plant on a plantation scale.

The general impression with growers is that unless they know the art of cocoa manufacture, cacao-growing would not be profitable. This is, however, not true. The grower can just grow the trees, and sell the cocoa seeds after processing to the chocolate manufacturer. Cocoa processing or curing is quite simple and does not requires any machinery or a large investment. Of course, the grower could also be a manufacturer of cacao products, if he so chose, in the same way as a tea planter may be a tea factory owner. Unlike tea and coffee, however, cacao can be cultivated in small plantations, perhaps on a home-compound industry scale too.

CLIMATIC REQUIREMENTS

In the commercial regions of the world, cacao has been raised mostly as a rain-fed crop. Cacao loves heavy rainfall. In India, it has been successfully raised in low and medium rainfall areas also, as in the case of the Kallar (45 inches) and Burliar (60 inches) Fruit Stations in the Nilgiris, but not without supplemental channel irrigation. In Kerala State, however, the tree has been grown successfully under entirely rain-fed conditions, in situations where the annual rainfall ranges between 80 and 120 inches.

From the experience gained so far, it is clear that cacao revels in warm situations. A temperature range of 50° to 100°F appears to be quite agreeable to it. The performance of *Criollo* trees on altitudes of 3,000 feet and above has not been quite comparable to that of the trees on lower elevations, perhaps due to the colder conditions there. Provided the optimum rainfall and warmth are available, the trees maintain a satisfactory growth on altitudes ranging from sea-level to 2,500 feet.

VARIETIES

A number of cacao trees are found growing in India, mostly in the Kerala, Madras and Mysore States. Some of them are more than 30 years old. In Madras

State, the most important area, which comprises about a dozen old trees, is in the lower fringes of the Nilgiris in and around the Kallar and Burliar Fruit Stations.

From their tree and pod characters, and the ultimate product obtained from them, the variety obtaining in the Nilgiris has been declared to be *Criollo*, very highly valued for its superior chocolate but a poor yielder; it is also believed to be more susceptible to disease than *Forestero*, the world's most important commercial variety.

Some of the trees occurring in Kerala and Mysore States do not strictly conform to the description of *Criollo*. Apparently, the plants are of a hybrid origin with a predominant *Forestero* blood, as indicated by their bean colour. Nevertheless, these trees are more vigorous and appear to be hardy from the way they have tolerated open field conditions and scanty cultural attention.

Cacao trees are easily propagated by seed. But recent research has indicated that vegetative propagation through inarching and cincturing is also successful. Seedlings can be raised either *in situ*, or in plant baskets, as in the case of coffee plants, and eventually transplanted in the field.

CULTIVATION

Cacao is a shade-loving tree. Almost everywhere in the world, it is grown under shade. There are many suitable shade trees for the cacao: banana, nutmeg, rubber, *Erythrina*, cassava, *Pithecolobium*, *Gliricidia*, etc. It is best to select the shade tree according to the regional agronomic practice. As far as possible, it should supplement the income from cacao without sacrificing the interests of either. Banana, tree spices, rubber, cassava are some good examples. In Kerala, cacao is seen to grow, besides these, with coconut, arecanut, jack fruit, breadfruit, etc.

Immediately after planting the cacao seedlings, low shade is provided by erecting artificial *pandals* ; it is then followed by a secondary shade meant to last a considerable time.

Normally, cacao plants are set out in the field with a distance of 12 to 15 between trees and rows. The trees require constant mulching with leaves or trash. The mulch helps check weed growth and provides adequate organic matter which acts as a fertilizer.

There is as yet no precise knowledge of the manurial requirements of the cacao with reference to our soils. In South India, the trees have grown and fruited very satisfactorily with an annual dose of 1.25 pounds of superphosphate, 0.25 pound of ammonium sulphate and 100 pounds of compost per adult tree. It is well-known that the cacao is a good feeder of potash. This fact should, therefore, be kept in view in planning any balanced manurial schedule for cacao.

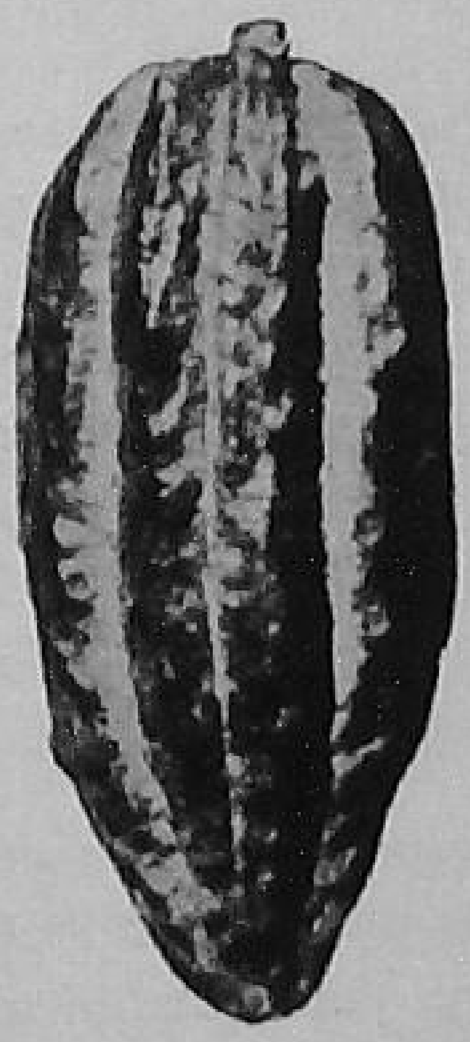
Seedling trees generally start bearing after four to five years, while grafts and layers (in Madras State) are reported to have fruited about a couple of years earlier.

CURING

Curing is perhaps the most important factor in cacao-growing which is held to be one of the major obstacles to the extension of this crop. Curing of cocoa is, however, neither very elaborate nor costly, it should not really make the grower hesitant to take to cocoa cultivation. In many home-compounds in Kerala cacao trees are denied attention and their pods wasted.

Curing is the process by which the cacao seeds or "beans" are brought to a marketable condition. It is more or less similar to the curing of coffee berries. The curing, however, does not straightaway lead to the chocolate powder that we buy in the market. The beans have to undergo further processing.

Ripe cacao pods are harvested and heaped up for three to four days to facilitate removal of the beans.



A cacao pod

They are then cut open and the beans scooped out for fermentation.

In Ghana, fermentation is done by piling the beans in large heaps, covering them with banana leaves and leaving them for four to six days, with occasional turning. The object of fermentation is to get rid of the pulp, to remove the bitter taste from the beans and to help the development of the characteristic chemical compounds, including theobromine, which give cocoa its invigorating properties.

The heaping process is a comparatively crude method. A better and more scientific method is the "box" method. A simple "sweating box," which is a small dealwood case, is used. Usually, it measures 2 ft. × 1½ ft. × one foot and holds about half a hundred-weight of fresh beans when filled to a height of six inches. It has a tight-fitting lid at the top, and the bottom is with 50 to 100 holes, to let out the "sweating."

The beans are put in the box and covered over with layers of banana leaves ; it is then tightly closed. The beans begin to ferment after some days, the period depending upon atmospheric conditions. It has been found that the curing of beans is quicker and more perfect in the warmer months of March and April than in the cold months, *i.e.*, December and January.

During fermentation, the beans are warmed up by the heat of the fermenting pulp. The oozing liquid should be drained out often, at least every two days. The beans should be turned periodically or changed from one box to another soon after the fermentation commences.

As soon as the fermentation is over, the beans are dried in the sun. Drying takes from two to ten days, depending upon weather conditions. The beans are shade-dried for two days to give the product a uniform crimson-brown colour. It is in this form that the cured material is sold. Under Burliar conditions, a thorough curing of *Criollo* beans was possible by the above process in a total of 12 days, yielding a 19 per cent recovery of high quality material. A hundredweight of fermented beans fetches up to Rs. 120, or even more. Thus, an acre of cacao should bring the grower a profit of Rs. 500 to 600. Account must also be taken of the supplementary income from the shade crop.

The fermented beans are later cleaned, roasted and shelled, and the resulting product is called cocoa nib. The nib is crushed, and added to sugar, forms drinking chocolate. In the process of manufacture of cocoa powder, the excess fat known as cocoa-butter is expressed. The cocoa-butter added in proper proportion to cocoa powder with sugar gives the chocolate. Cocoa-butter is also used in confectionary, margarine-making and perfumery. Cocoa is not only a good beverage but is also a rich food. It contains good proportions of proteins, fat, minerals and vitamins A and E.

Since extensive areas in Kerala, Mysore and Madras States are suitable for cocoa-growing, India can not only become self-sufficient in cocoa, but also export it. The cocoa industry in the Ghana and Kenya is reported to be losing ground, for the varieties there have lost their identity due to indiscriminate mixing up of fine and coarse types and a large area of the plantations has come into the grip of very serious diseases. With some of the best varieties of cocoa maintained in a pure and healthy condition in our country, India is, therefore, placed in an advantageous position in the cocoa world. We have only to wake up to the situation and take to the new industry seriously.

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EVEREST

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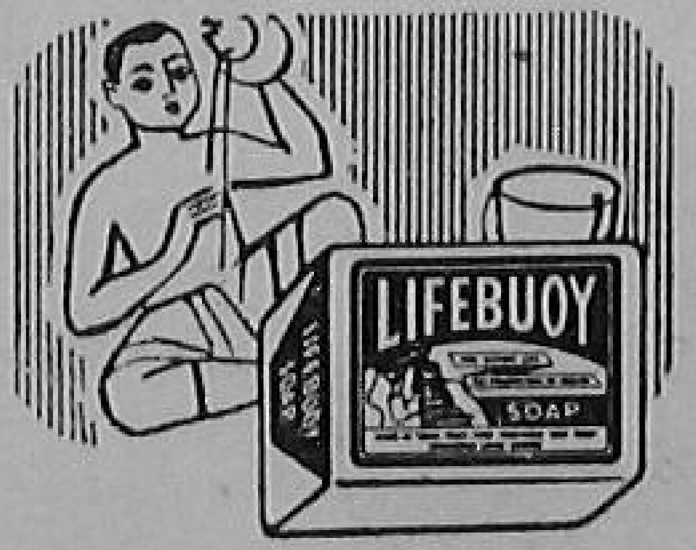
Rural India is today developing rapidly; and the cottage industry, that centuries-old tradition of India, is gaining a new importance—not only because it provides gainful employment to millions of our countrymen, making them economically independent, but also because it is vital for the nation's prosperity. How essential, then, to protect the cottage industry worker's health.

And yet, because the cottage industry worker cannot avoid picking up dirt while working, he daily runs the risk of ill-health from the disease germs that all dirt contains. For this reason alone, it is important that self-help programmes in our villages should always point out the need for *self-help* in personal health and hygiene.

The villager who learns for himself and teaches his family the hygienic necessity of washing regularly with a good soap, particularly LIFEBUOY SOAP—because it washes away the germs in dirt—is doing very much more than acquiring a healthy habit: he is contributing to the nation's health and progress.



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Try Fertilizers To Increase Your Jowar Yields

by

S. S. Bains

**Indian Agricultural Research Institute
New Delhi**

IT seems *jowar* has not received its due share of fertilizer so far. This is probably due to the fact that more than 80 per cent of the area under *jowar* is rain-fed. Also, research has so far concerned itself mainly with evolving better varieties and improving cultural practices. Work done at the Indian Agricultural Research Institute, New Delhi, has, however, shown that even under rain-fed conditions the green fodder yield from *jowar* can be increased. The additional gain to the farmer by using fertilizer works out at about Rs. 28 per acre.

The one-acre plot on which the experiment was laid out was divided into four parts with strong bunds all round to check erosion and outflow of rain water. The fertilizer mixture was well incorporated into the soil. The crop was sown broadcast. The rainfall received during the crop-growth period in the two years, 1957 and 1958 was 22 inches and 35 inches respectively. There was no difference in yield in the two years, and about 60 maunds per acre were harvested.

When five tons of farmyard manure alone were applied, the average yield of the two years was about 113 maunds. But when the farmyard manure was supplemented with 150 pounds of ammonium sulphate and 125 pounds of single superphosphate, the average went up to 173 maunds. Thus, by using fertilizer, an extra yield of about 59 maunds was obtained, which left a net profit of about Rs. 28 after allowing for the cost of fertilizer, its application, etc.

Jowar is an important millet crop of India and occupies nearly 42 million acres. It is grown both for fodder and grain. In Northern India only *kharif* types are grown, but in the western parts of the country both *kharif* and *rabi* types are cultivated. The crop generally follows cotton, wheat, gram and groundnut in the rotation.

However, the average yield of grain is only about 340 pounds and of forage, 1,500 pounds per acre. Thus, there is considerable room for taking these figures up. Fertilizer use is surely a good way of doing it.

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BOMBAY—14

Veterinarians And Agricultural Economy

by
Sir Thomas Dalling
Consultant of the FAO, Rome
Italy

VETERINARIANS are individuals who have undergone special training and have received appropriate education so as to be able to undertake the many duties which fall upon the veterinary profession throughout the world. These duties vary, but are essentially concerned with the health of animals.

Agriculture occupies an important place in most countries, and the maintenance of livestock of different kinds is an essential part in developing any agricultural policy. The wealth of a country is often judged by the numbers and quality of its livestock, and in some countries the livestock industry is already in an advanced state. In others, hitherto less developed, more attention is now being given to improvements whereby the demands of the human population for proteins of animal origin, at present in short supply, can be met from within a country as well as with expectations that exports of livestock and livestock-products may be possible.

Veterinarians have essential duties with livestock everywhere. For best results from livestock, it is necessary to give attention to three points: (*a*) the type of animals for the purpose for which they are required ; (*b*) the nutrition of the animals suitable and necessary for that purpose ; (*c*) the health of the animals, to ensure that maximum results may be obtained.

It appears often to have been considered, possibly more in well-developed countries, that veterinarians are concerned with, and their services used almost exclusively for the treatment of animals suffering from some disease or injury. This may have been largely true in past years, but it no longer holds good, for, generally speaking, the aim now is to prevent rather than cure disease. Valuable individual animals will certainly continue to have much veterinary attention and rightly so, but the trend today is to deal with the herd or group of animals rather than with the individual. This holds good in all parts of the world although, even in less-developed countries, circumstances arise when the individual animal must receive attention, as for example, valuable imported breeding stock. Although this trend may be looked upon as somewhat of a new development, many examples can be given of mass treatment of livestock carried out by veterinarians in the control of epizootics.

GUARDIANS OF ANIMAL HEALTH

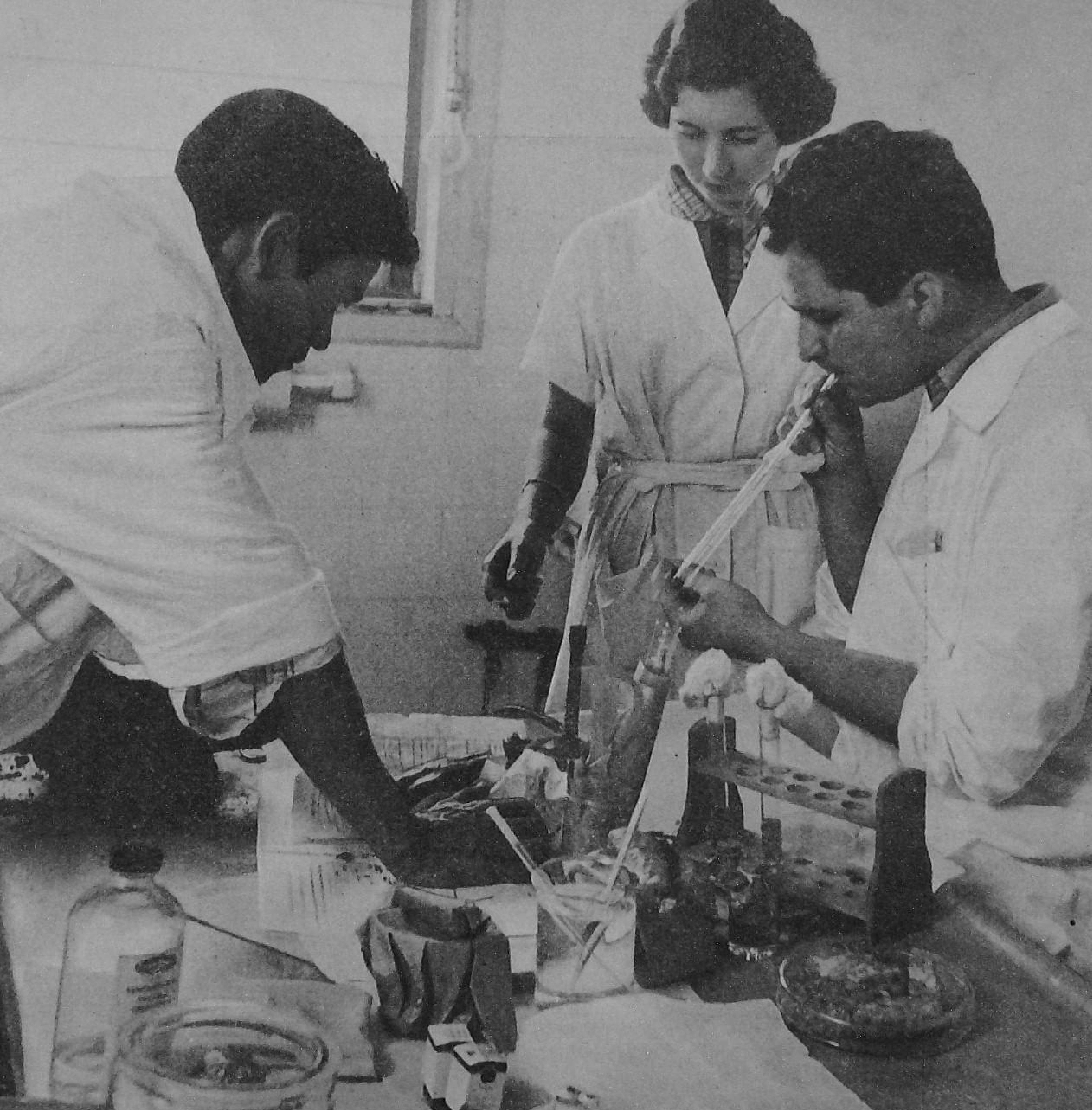
Veterinarians are, primarily, the custodians and guardians of the health of animals. Their important duty is, therefore, to prevent disease—which is any departure from health—by taking any action when considered necessary, to restore health and to maintain and improve health to meet the requirements demanded from the animals. Since animals are kept for specific purposes and health plays an important part in meeting the demands, veterinarians must concern themselves to some extent also with breeding, nutrition and general management or husbandry of livestock. It is not intended to convey the impression that veterinarians should be responsible for this general subject. From their training and experience, however, veterinarians are best suited to give attention to the aspects of these subjects which have any bearing on the health of animals. In animal breeding by artificial insemination, which is now being encouraged throughout the world, the possibility of conveyance of venereal diseases comes within the province of the veterinarian, as do the effects on health following the feeding of introduced plants and crops.

CONTROL MEASURES

Diseases of a highly infectious nature, with the prevention and control of epizootics or enzootics, must always be in the minds of veterinarians in every part of the world. Without the practice of control measures, the resulting damage can be great, with consequent loss not only to individuals but also to the country's economy. In countries which export livestock and products of animal origin, the losses can be felt over a long period, because importing countries often prohibit the entry of any livestock or their products from countries or areas in which certain animal diseases exist, or demand certain conditions which are expensive to fulfil. Modern methods of diagnosis and preventive treatment are gradually reducing the prevalence of many of the recognized infectious animal diseases, and eradication of some of them from some parts of the world is now in sight.

"ZOONOSES"

While veterinarians accept responsibility for the care of the health of animals from the point of view of livestock economy, they have also an added responsibility



Veterinarians at work in a research laboratory

because some of the diseases affecting animals are transmissible to human beings. The group of such diseases, termed zoonoses, is quite large. Much credit and appreciation must be given to the medical authorities for their excellent work in the treatment of human beings suffering from such diseases, for their efforts are leading to good results. But it must be pointed out that the reservoirs of these infections are animals and, until they are eradicated from animals, the risk of the infection being conveyed to human beings through contact or the consumption of infected animal products will remain. The economy of a country or area can be

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influenced to a considerable extent by the loss in man-hours due to such infections. Veterinarians, therefore, have a considerable responsibility in connection with the prevention of human diseases and suffering, and have to be considered as "guardians of human health" in some of its aspects.

CERTIFICATION

Again, we have to consider the work of the veterinarians in ensuring that meat and meat products are supplied to the consuming public in a safe and wholesome state. In most countries where large slaughter-houses are used, veterinarians are responsible for ensuring that all meat and meat products leave the premises in a satisfactory condition for human consumption. This entails the inspection of animals before slaughter, the examination of meat and offal, the condemning of parts considered to be unfit in any way for human consumption, and giving the necessary attention to the cleanliness and hygienic conditions under which all the operations in the slaughter-houses are carried out.

In some countries, the duties of veterinarians extend even further and they are responsible for the satisfactory condition in which fish, and sometimes all edible products, are made available to the public. In such cases, their responsibility does not end until the food-stuffs are displayed for sale in the retail shops and markets.

In countries which export meat and products of animal origin, including such items as hides and skins, wool, hair, bones, etc., veterinary certification of their freedom from certain infectious conditions is required by importing countries.

We have discussed livestock and their products. We must not, however, forget the smaller animals and poultry. Dogs and cats are highly prized in some countries, the former not only for the work they do for man but, together with cats, for their companionship which adds to the happiness and contentment of the owners. In many towns throughout the world, veterinarians are busily employed in problems of health and disease of these animals ; note must also be made that dogs and cats are also susceptible to some diseases communicable to human beings, for the recognition of which veterinarians must always be on the alert.

These are some of the main duties of veterinarians, all of which have some bearing on world economy. Other duties are carried out largely by veterinary services, as opposed to practising veterinarians, but sufficient has been said to show the important place occupied by veterinarians in the world today.

RESEARCH WORK

No matter how efficient veterinarians or veterinary services may be in the work allotted to them, they depend on the results of research work for their knowledge of new methods of dealing with problems of animal and human health. It has been truly said that a profession is "dead" without research activities. For many years, veterinary research was starved by the lack of funds and it was left to the keenness of a few, often supported by private enterprise, to engage in the subject. Notwithstanding the many difficulties, these workers made valuable contributions to the general knowledge of the causes, prevention and treatment of animal diseases. In recent years, however, much more financial support from public funds and some further contributions from private enterprise have become available. This has resulted in assuring young men and women a future career in veterinary and other research work. Thus, research has attracted more and more personnel and the field is now being covered to a marked degree. More and more research work is being undertaken and problems are gradually being solved. Veterinary activities are also profiting by the results of research work in other branches of science, sometimes far removed from animal diseases, for any discovery which may have a bearing on their work is largely applied by veterinarians. Team-work between veterinarians and other scientifically-trained personnel is now the "order of the day" and is providing solutions to many problems. Here again, then, is a veterinary activity of importance to world economy.

EDUCATION

In order that veterinarians may undergo the necessary training and gain experience in the many subjects with which they must be familiar, their education is carried out in veterinary schools or colleges, which are usually part of a University. Every student who enters a veterinary school after attaining matriculation standard in general education is required to pursue a course of study in the subjects of basic science in order that he may appreciate and understand the more applied subjects peculiar to veterinary science and medicine. For the teaching of these subjects, the veterinary student often attends classes along with others reading for degrees in sciences other than veterinary. The more purely veterinary subjects are taught by veterinarians experienced in teaching and the teaching field is now claiming more and more young men and women with the necessary outlook and aptitude. These individuals are doing important work in preparing veterinary undergraduates for their future careers throughout the world.

Very often these teachers also engage in refresher courses held periodically and attended by graduate veterinarians, the object of which is to give information on the latest discoveries, the application of which will ensure more rapid and surer results in dealing with animal diseases.

Veterinarians are also employed in laboratories which are largely devoted to the diagnosis of disease and the solutions of problems which present difficulties to veterinarians in the field.

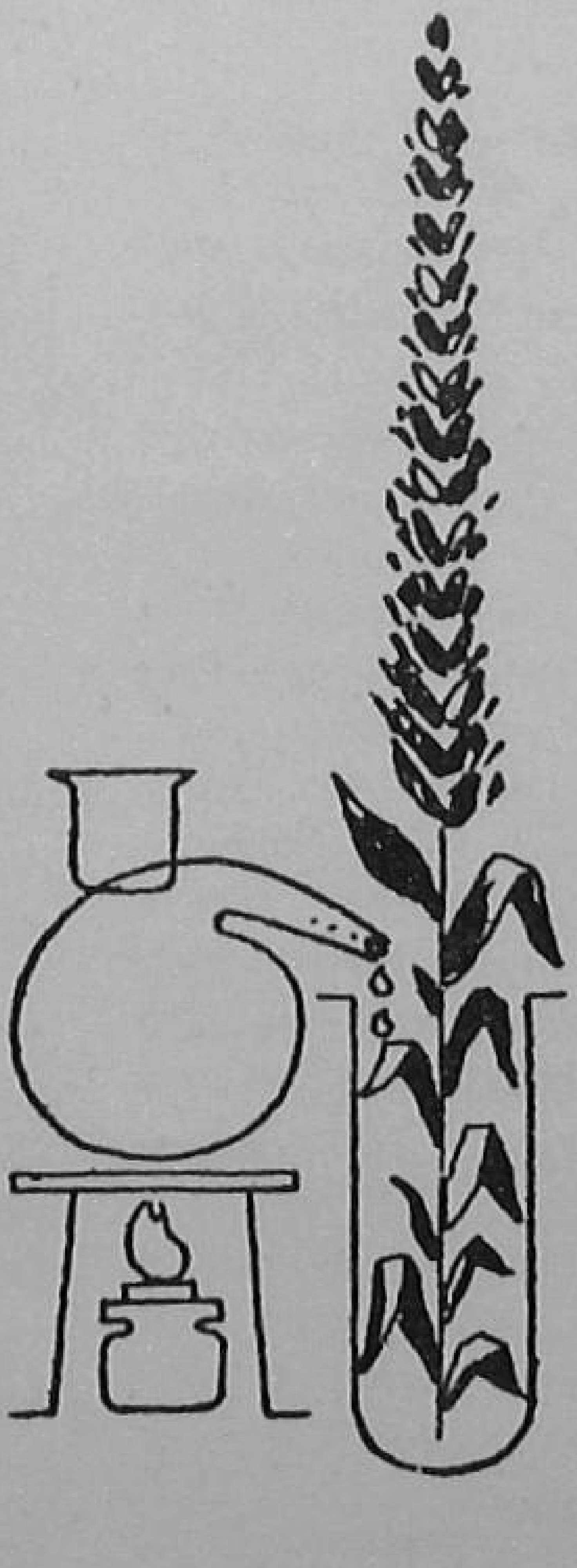
INCREASE IN PERSONNEL

It will be understood that the number of veterinarians may not be in proportion to the number of animals in a country or area—the stage of development of a country and the economic aspects of the livestock industry being closely related to their numbers. It is of much interest, however, to observe that practically all countries throughout the world now appreciate more fully the value and importance of veterinary services. This is reflected in increases in veterinary personnel in many countries and the establishment of veterinary services, sometimes on a modest scale as a beginning, in countries which are now becoming independent.

It can also be appreciated that all the details of the veterinary activities as described in this article cannot always be carried out by veterinarians, especially in countries in which the livestock population is scattered over large areas and in which the economy cannot support large numbers of graduates of the veterinary profession. Much useful work is being done by laymen, trained for specific duties and working under the supervision of veterinarians. Such personnel have a useful place in veterinary activities in some countries.

Attention must be drawn to the assistance rendered by international bodies interested in veterinary work. In the further development of some countries, the role played by agriculture has not been omitted, and attention is being given by these bodies to the livestock industry. Realizing that animal health is one of the important considerations in assisting the less-developed countries in their economy, and the need for producing more and more supplies of protein of animal origin throughout the world, these international organizations collaborate with the Governments of such countries by employing veterinarians to visit and often reside in the countries for periods, advising on and participating in the control of animal health and disease. Much valuable work has already been done and these activities will be continued as long as the necessary finances are made available.

The soil must be fed before it can feed man. A famished soil is a spent force. At "Alembic" we are in touch with the latest developments in fertiliser chemistry, and so are able to offer India's farmers and their "hungry" land a "chemical food" that it vitally needs—ALCHEMPHOS, a mixed fertiliser and first-rate nutrient which enriches the soil and ensures an abundant yield.



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POPULAR BELIEFS ABOUT TREES

by

G.R. Koppikar

One who raises gardens with excellent fruit trees goes to the abode of Lord Shankar and stays there for three *yugas*.

One who plants Tulsi is esteemed in Vaikunth for as many thousand years as the days for which the plant is preserved.

One who plants an Amla tree performs many *yagnyas*, donates the whole earth and is a Brahmachari for ever.

The religious person who plants three Neem trees will go to the abode of the Sun and will remain there for three thousand years.

One who plants five mango trees by the roadside or in a garden ensures the welfare of his fourteen generations of the past and future together.

Parvati is pleased with him who plants eight trees of Oudumber, and he enjoys good health.

One who plants Rayan, banana, grapes and Charoli (*Buchannania latifolia*) along with jack-fruit does not become unhappy for seven births. By planting other trees useful for their fruits and flowers, one attains the merit of having donated one thousand cows.

Black, gray, violet, red, white and yellow soils are sweet, sour, salty, pungent, bitter and fermented, respectively.

Trees of jack-fruit, taudy, bamboo, Neem, Jaman, *Sesamum*, Peepal, Kadamb, Kokam (*Garcinia indica*), date, betel-nut, banana, Tiwas (*Eugenia dalbergioides*), Kevada coconut, etc., grow in dry soils.

Trees of drumstick, Bel, Satvin, Nirgad, Ashok, Shami, Nerium, Bor, Crimson and Nimb, and vegetables grow in moist soils.

Trees should be irrigated on alternate days during the autumn and winter, once daily during the spring and, in the morning and evening, during the summer.

The roots of a tree should be watered so as to satisfy its needs. What is the good of expressing the quantity of water in terms of the number of potfuls?

The stagnation of water in the ring round the trees should be taken as indigestion; thereafter, no more water should be supplied.

All newly planted trees should be watered in the morning and evening, and should be protected from cold, heat and winds.

When there is no rain during the rainy season and autumn, the ring round the tree should be watered.

The months of Ashadha and Shravan (June-July) are proper for sowing seed and planting. Creepers are planted in seasons other than Greeshma (summer).

Trees planted close to each other do not grow due to shade; if planted far apart, there is danger from winds; and if trees belonging to different (botanical) groups are planted near each other they do not feed properly. Such a plan of planting is not proper.

Trees bearing useful flowers and fruits and such trees the branches of which do not break in the wind, should be planted. Trees which bear fruits without bearing flowers are inauspicious (except jack-fruit). Therefore, these trees should not be planted in the garden.

Protection should be afforded to trees from frost, fog, smoke, fire, pupae and caterpillars.

Trees smeared with the ash of the trees which are burnt due to electricity (lightning) are not affected by frost.

The mice that ate iron

(A TALE FROM THE PANCHATANTRA)

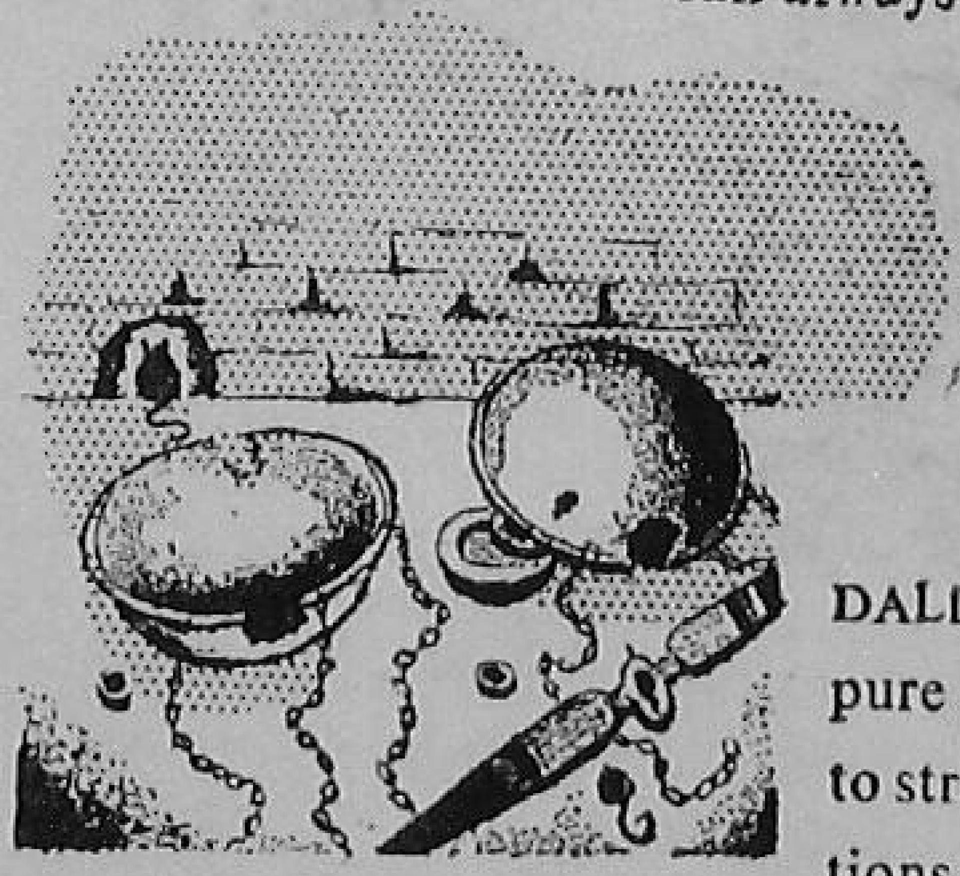
NATUKA was a merchant who lost all his money and left home to do business in a foreign country. Before he left, he went to his friend Lakshman and said: 'Please keep this pair of scales for me until I return. I do not wish to sell it, because it has been in the family for many years.' Then he departed.

In a short time, Natuka made a lot of money and returned to his native city. Going to Lakshman, he said: 'Thank you for keeping my scales. May I have them back now?'

'Your scales have been eaten up by mice,' replied his friend.

'How can mice devour such a huge pair of scales?' cried Natuka angrily. 'It weighed 250 seers.'

'There are a great many mice in my house. Surely 250 seers are not too much for so many of them.'



Natuka began to think. 'Well,' he said with a smile, 'it's not your fault. It's just my bad luck. Now, I want to go and bathe in the river. Will you please send your son with me to carry my bathing things?' Lakshman could not refuse this simple request.

On their way back from the river, Natuka thrust the boy into a cave and blocked the entrance with a great rock. He then returned to Lakshman's house. 'Where is my boy?' asked Lakshman.

'A great hawk swooped down and carried him off from the river bank," explained Natuka slyly.

'You liar! How can a hawk carry off a fifteen-year old boy?'

'If mice can eat iron scales weighing 250 seers, surely a hawk can carry off a boy of fifteen. Listen to me, Lakshman! If you want your son, give me my scales.'

Natuka got his scales.

MORAL: Whoever has Truth on his side can always expose a falsehood. Take Vanaspati for instance.

Eminent scientists have shown that Vanaspati is a wholesome food. Tests prove it.

DALDA Vanaspati is made from pure vegetable oils, according to strict Government specifications. An all-purpose cooking medium, DALDA is an economical source of Vitamins A and D. There are 700 International Units of Vitamin A added to every ounce. No wonder housewives everywhere agree: *DALDA is more than a cooking medium—it's a food!*

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How Best To Ensure A Pure Seed Supply

by

Gurdial Singh

ONE essential of profitable crop farming is improved and pure seed, and our agricultural departments have put in a lot of effort to popularize improved seeds of various crops. It would not, however, be wrong to say that the seed even at Government agricultural farms, though improved, may not always be pure, i.e., it may contain an admixture of other varieties. To some extent, this becomes inevitable when different varieties of the same crop are grown at a farm, as it is very difficult to sort out their seeds if they get mixed up.

The Government agricultural farms, as at present, concern themselves with experimental work only and, therefore, do not have enough improved seed to spare for the cultivators. The agricultural departments, therefore, buy large quantities of seed from big landlords, which is then sold to farmers through agencies licensed for the purpose. Although the seed growers are always advised to take due precautions to see that the seed to be purchased from them does not get mixed up with others, generally at some stage or other between sowing to storage, the inevitable does happen.

NO ROGUING

Let us take the example of the seed of a particular improved variety, say, of wheat. It is sure to contain certain impurities. These impurities may be seed of other improved as well as unimproved varieties. When handling big lots of seed, it is not possible to rid the seed of them. Thus, the impurities also get sown along with the improved seed. Roguing is easy in the young stage of the crop, but at that time it is not possible for even experts to spot out undesirable plants. When the crop comes into ear, and especially when it is about to ripen, the impure plants and even diseased plants show out, but roguing is generally not done at this stage, the reasons being: the farmer is not inclined to pull out plants when they are nearing maturity, it is not possible to move freely in the field without damaging the plants, and the labour and time involved are considerable.

Crops of different varieties are harvested and stacked alongside and even threshed and winnowed on the same floor. Again, very few seed growers keep a sufficient number of bags to store the seed, and the produce is usually stored loose in heaps, without any indication of variety. Even when bags are used, workers cannot avoid admixtures, not being sufficiently skilled; labelling also is not done.

Though the departments exercise every possible care to inspect and approve seed samples before making a purchase, impurities do escape the naked eye. It is quite possible that at the time of approving a certain lot, some percentage of impurities is allowed also. After the bargain has been approved and struck, it becomes very difficult to check all the bags or the stock purchased. An effort is sometimes made after the purchase to clean the seed by sieving and winnowing, but these are enough only to remove dirt, shrivelled grains and weed seeds.

Thus, the cycle continues and the seed of a particular variety is never free of impurities and admixtures.

THE REMEDY

The only remedy for this situation is that large Government seed farms should be started at different places in India. At each farm, the improved seed of only one variety each of different crops should be sown and propagated. Sorting out of seed of foreign and impure varieties and roguing should be resorted to from sowing to storage. All impure seeds and rogued plants should be completely destroyed or disposed of in such a way that there is no possibility of their getting into the main variety. In the case of the wheat crop, clipping the ears of the foreign varieties will be more convenient than pulling out whole plants.

The pure seed from the seed farms should be sold directly to the farmers and not through seed agencies. The supervision of seed agencies is an extremely difficult task because the seed agents are always tempted to indulge in admixtures because the improved seed sells at a good price. If the amount of commission, compensation in the form of shortages, etc., allowed to the seed agents at present operating is taken into consideration, there is no doubt it would be much more economical to set up an exclusive organization to deal with the problem of seed distribution.

"Sunehra Bara" and "Daryai" Provide Good Fodder For Cattle

by
H.C. Malik
Assistant Economic Botanist, Fodder
Sirsa, Punjab

RESULTS of a four-year trial with 12 natural grasses at the Hill Grasses Research Station, Palampur, have put *Sunehra bara* (*Bothorichloa intermedia*) and *daryai* on top as regards yields. *Sunehra bara* gave 983 maunds per acre, followed by *daryai* with 885 maunds. *Kodri* was found to be the next best yielder, with special tolerance to trampling and other adverse factors.

More than two-thirds of the total feed requirements of livestock in our country are met from grasses growing in natural pastures. They are all the more important in the hills where no other feed is available. Even though these natural pastures are not alive throughout the year due to extremes of climate and seasonal rainfall, yet they are the mainstay of the farmer's cattle.

How important a certain natural grass is in a pasture depends on its productivity, sprouting ability and its acceptibility to livestock. Whereas most of these grasses are eaten by cattle in their young leafy stage, they widely differ in yield. Their yield depends upon their leafiness and time of maturity, ability to recover after grazing and tolerance to drought, high temperature and trampling.

Grasses with a creeping habit of growth and more of basal leaves often persist better under intensive and continuous grazing than erect-growing ones. But their yield may be lower due to lack of tolerance to other factors. On the other hand, vigorous and high-yielding grasses with some drought-resistance and good recovery may be so aggressive as to hinder the growth of others growing with them.

IN MIXTURES

In the hills, grasses grow in mixtures of varying degrees. They sprout and provide grazing during the summer monsoon from July to September-October. With proper management and rotational grazing they make good growth and provide enough pasture. The reverse is the case if grazing is not properly planned and even creepers with a meagre foliage may eventually disappear.

The common grasses in these natural grazing areas are: *lamb* (*Heteropogon contortus*), *bara dhoulu* (*Chrysopogon montanus*), *chhota dhoulu* (*C. gryllus*), *sunehra bara* (*Bothorichloa intermedia*), *sunehra chhota* (*B. pertusa*), *kodri* (*Paspalum orbiculare*), *lonji* (*Themeda anathra*), *daryai*, *tandla* (*Sporobolus diander*), *bara tandla* (*S. indicus*), *Eragrostis gangetica* and *bari jhan* (*Pennisetum orientale*). All these are perennial in nature and tolerant to grazing and trampling. However, they differ in their sprouting ability and growth.

In the Palampur trials, annual cuttings of these grasses were taken between June and December. While only one cutting could be taken in the first year, three cuttings were possible in each of the subsequent three years. The yields obtained from the ten cuttings are given below.

Grass	1954-55 (*one cutting*)	1955-56 (*Total of three cuttings*)	1956-57 (*Total of three cuttings*)	1957-58 (*Total of three cuttings*)	*Total production of four years*
		(*Maunds per acre*)			
Lamb ..	59.0	90.0	175.7	197.56	522.35
Dhoulu ..	107.0	87.5	190.5	218.45	603.95
Chhota dhoulu ..	82.0	135.0	308.0	321.58	846.58
Palwan ..	227.0	182.5	271.5	302.19	983.19
Kodri ..	184.0	117.5	278.5	257.52	855.62
Sunehra chhota ..	93.0	122.5	183.5	260.37	559.37
Lonji ..	61.0	102.5	290.0	336.93	790.43
Daryai ..	145.0	117.6	297.9	324.63	885.03
Bara tandla ..	48.0	42.5	68.5	77.53	236.53
Tandla ..	61.0	87.0	182.2	143.34	477.34
Eragrostis gangetica ..	82.0	97.5	218.0	168.46	565.96
Bari jhan ..	111.0	130.0	235.7	267.78	744.48

It is clear that *tandla* and *bara tandla* are the lowest yielders. In general, the productivity of all the grasses increased with their age and establishment. The

grasses which got established quickly and sprouted better after cutting were generally found to be high-yielding and rather aggressive. This was the case with *sunehra bara* and *daryai*.

The food value and some features of the various grasses tried are given below.

Grass		Organic matter	Ash	Food value (percentage) Protein	Calcium	P_2O_5
Lamb	..	94.64	5.36	8.37	0.432	0.202
Bara dhoulu	..	95.32	4.68	7.00	0.560	0.185
Lonji	..	93.08	6.92	8.18	0.976	0.299
Jhan	..	93.66	6.34	14.88	0.336	0.358
Kodri	..	92.74	7.26	12.75	0.368	0.301
Sunehra bara	..	94.20	5.80	8.18	0.512	0.225

SOME FEATURES

Lamb

A perennial grass, common in the submontane tract up to 4,000 feet. It prefers rocky, inhospitable lands. Forms excellent hay and is eaten greedily by cattle before the formation of inflorescences. When in fruit, and especially when mature, cattle avoid it, as severe sores are caused in the gums by the awn.

Bara dhoulu

An extremely variable perennial grass found on dry sandy or stony soils with little capacity for holding water. Considered to be a very valuable fodder grass and can stand repeated cuttings to a great extent.

Chhota dhoula

A perennial grass which also prefers stony and inhospitable soil liable to dry at times. Also considered to be a good fodder grass.

Bari jhan

A perennial grass which favours dry hillsides. A fodder grass of low value as compared to *Chrysopogon*.

Kodri

A perennial grass of very hardy nature. Grows on poor soils but prefers wet soils. Though it has some poisonous effect, it is largely used as fodder and cattle are said to be partial to it.

Sunehra bara

A tufted perennial fodder grass which is commonly found in the hills up to 6,000 feet. Eaten by cattle when green and used for thatching or ripening. Prefers damp places and found growing on heavy and poorly-aerated soils.

Sunehra chhota

A perennial grass, sometimes confused with *Dicanthium annulatum*. It is a common species on *bhabbar* soils. Continues to flower throughout the cold weather. On grazing, it sends out numerous prostrate shoots rooting at the nodes. The grass is universally esteemed as a good fodder both for grazing and stocking. It can stand long droughts and continues to grow in winter if weather is not too severe.

Lonji

A tall, robust perennial grass found between 6,000 and 8,000 feet. It is found on scattered, shady slopes and is the only undergrowth of *chil* forests. A good fodder grass.

Andropogon pumilus

Although it will grow and flourish on moist soils, it is more at home in the dry and semi-dry tracts. Considered to be a good fodder grass either green or as hay. Under cultivated conditions, it makes luxuriant growth.

Tandla

This grass may be annual or perennial, but is an important fodder grass. A favourite fodder for horses and cattle, but with small yield.

Bara tandla

Observed on the outer foothills of the Himalayas. A robust, perennial fodder grass, often found on inhospitable soils and can withstand drought. It does not form much hay, but is a splendid feed while young and as a pasture plant.

Eragrostis gangetica

A perennial grass usually found in low-lying, heavy ground. It has a reputation as a good fodder grass and can be made into hay.

* * *

CETYL CUTS ON EVAPORATION

Cetyl alcohol has proved to be a boon in Australia where the annual rainfall is only 16 inches. One millionth of an inch, spread over a water surface, prevents 40 per cent of the evaporation that normally takes place. When cetyl was used in the Faridabad tank, it was found possible to have water even during the hottest months—April and June; even sugarcane, which requires a lot of water, could be grown. Similar experiments were conducted at the Kukarahally tank in Mysore and the Bunderi tank of the Poondi reservoirs in Madras.

Cetyl is produced from whale oil.

READERS WRITE

May I ask the co-operation of your readers in testing a cheap and simple remedy for white ants or termites?

One of our members has found that seedlings can be protected from the attacks of these pests by covering the bottom of a bucket with an inch-deep layer of the growing (not dead) leaves of the Indian custard-apple (*Anona squamosa*), also called the sweet sop or sap, the sweet apple, or, in French-speaking countries, *pomme canselia* and pouring on boiling water. When the bucketful is cool, seedlings are watered with it; white ants are thus repelled for three weeks. The dose is repeated until they have grown past the stage of attack.

The leaves and seeds of the custard-apple contain an alkaloid which poisons white ants, and the crushed seeds make a shampoo once used by the Philippine Island and New Guinea warriors to keep their magnificent hair free of other pests. This discovery, linking botany, natural history, anthropology and an observant amateur gardener needs testing to find out whether it works on your local white ants, and how it can be applied to keep them out of the house and away from everything, from clothes to window frames.

Those who need the remedy can grow the tree, which is why science has never looked for this answer, because there is no prospect of anything to sell for industry, it is too cheap and simple. We need your readers' experiences to share with other countries, for this Association is composed of amateur experimenters in many countries working on a number of scientific "Cinderellas," including the control of the pests of agriculture and horticulture without chemicals.

We are not supported by any Government, Trust or Foundation, we run on members' subscriptions and carry out our unpaid research on trifling funds. Our quest is for methods that any farmer, gardener, peasant or coolie can use because they are cheap and simple—we offer, not know-how, but "let us find out together." Would readers who can try custard-apple leaves against white ants, or even send us custard-apple pips for trial in other countries, please write to us so we can help others with their knowledge?

—Lawrence D. Hills,
Hon. Secretary,
Henry Doubleday Research Association,
Bocking, Braintree,
Essex, England

'PHENOVIS'

Every sheep breeder knows that even when feeding on good monsoon grass his sheep often get thin and sometimes die. This is due to lakhs of very small worms that suck blood from the gut and so make the sheep weak.

Treatment with 'Phenovis' four times a year will control these worms. The first dose should be given just before the monsoon, the second and third doses should be given during the monsoon, and the last dose should be given one month after the end of the monsoon. Your veterinary doctor will show you how to give the drug.

Ask your Veterinary Doctor

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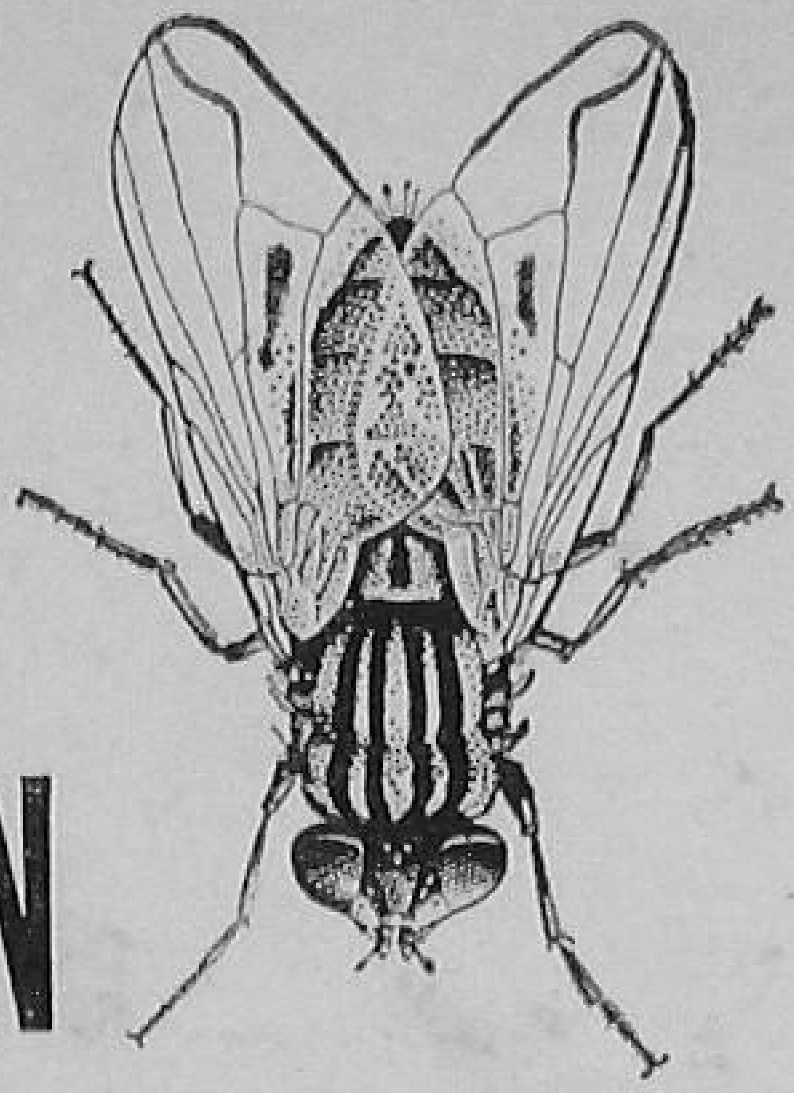

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